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THE
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WITH ILLUSTRATIONS.

1850.

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PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 8, 1850.

William Yarrell, Esq., Vice-President, in the Chair.

The following papers were read :—

1. **CONTRIBUTIONS TO THE KNOWLEDGE OF THE ANIMAL OF NAUTILUS POMPILIUS. BY J. VAN DER HOEVEN.**

There are hitherto but three original figures of the animal of *Nautilus Pompilius*. The first is that of Rumphius, in his 'Amboinsche Rariteitkamer' (No. xvii. at p. 62); the second that of Prof. R. Owen in his accomplished 'Memoir on the Pearly Nautilus' (London, 1832, pl. 1); the third, drawn by Mr. Laurillard, was given by Prof. Valenciennes in the 'Archives du Muséum d'Hist. natur.', ii. 1841, pl. 8.

The figure of Rumphius could only be deciphered after the discovery of a new specimen. As Prof. Owen has observed, the animal is represented in that figure in an inverse position. Guided by that observation, it is possible to explain some parts in that enigmatical figure, but many obscurities still remain, and the whole gives the impression of a drawing made by recollection, and after the doubtful suggestions of a discomposed memory. This seems still more probable, because the text informs us (p. 61) that the figures to which the indications of the description allude, have been lost.

The animals represented by Prof. Owen and Valenciennes were detached from the shells before they were presented to those distinguished cultivators of comparative anatomy and structural zoology. This circumstance explains some imperfections in the figures given by both. Prof. Owen, for instance, gives an incorrect form to that production of the mantle which covers the convex part of the shell's circumvolution projecting in the aperture, or to the part which the author calls "the dorsal fold" (see his pl. 1 b); the superior free

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margin of the mantle is lower than it ought to be, as it conceals in the natural state a great part of the funnel and the inferior half of the eyes. In regard to the last circumstance, the drawing of Laurillard given in M. Valenciennes' paper is more correct; but in other particulars it is deficient, chiefly because the soft part of the integuments which forms the visceral sac was torn off and wholly wanting. It ought to be observed also, that those two figures represent the animal replaced in a shell of the same species indeed, but not its own.

I suppose then that it may be perhaps of some interest to publish some drawings* I made, chiefly after two specimens, one of which was kindly presented to me in 1848 by Prof. Reinwardt; the other I received lately from our settlements in the East, by the kind exertions of His Excellency Mr. T. C. Baud, formerly His Majesty the King of the Netherlands' Minister for the Colonial Department.

The first figure (1) represents the animal from the left side in its own shell, which has been opened with a file at such a height, that the whole last chamber was visible, together with a part of the three following compartments. The hood (*a*), composed according to Prof. Owen by the conjunction in the mesial line of the two superior, excessively large digitations, covers with its projecting margin the superior surface of the pedunculated eye (*b*). The inferior half of the eye is concealed by the superior margin of the mantle, which covers also the greatest part of the digitations or lateral processes of the head (*c, c*). The extremity of the funnel (*d*) is visible and uncovered, the rest being contained in the anterior part of the mantle. There is no perforation or excision at this part of the mantle†, but the margin of it is entire and slightly convex.

The mantle (*f, f, f', i*) has its anterior part of a more thick and fibrose texture and a yellowish colour; the posterior part (*i*) forms a thin and nearly transparent membranous sac, containing the different viscera. The free superior margin of the mantle ascends behind the hood (*f'*) and forms the dorsal fold of Prof. Owen's memoir; but at the side view only a small portion of this fold is visible. Beneath the posterior part of the hood, the mantle offers on each side a large aponeurotic flat piece (*g*), of a bluish white colour and a kidney-like shape, being convex at its anterior side and somewhat concave at the posterior border. This plate is the posterior insertion of a strong muscular mass—the great muscle of the shell—which goes from this attachment in an oblique course, converging with that of the opposite side, to its anterior termination at the cartilage of the head. From this oblong patch arises a narrow aponeurotic stripe, both at the superior and at the inferior extremity of it. The oblong plate may be considered as an expansion and development of this band, which, encircling the whole mantle, separates its posterior soft part or the visceral

* The drawings, being on too large a scale for this work, will be published in the Transactions of the Society, vol. iv. Pl. 5, 6, 7, 8. The references are to those plates.—D. W. M.

† Professor Owen speaks of a large aperture through which the funnel passes. (Memoir on the Nautilus, p. 9.)

sac (*i*) from its free and thicker anterior part. The thin and membranous posterior part of the mantle is of a bluish white colour, but being imperfectly transparent, it seems to be dark at all places where it covers the bulky liver, whose colour is a dark red-brown, or chocolate-like purple. At the inferior part of the free portion of the mantle is a convexity (*h*), where lies a glandular laminated organ, secreting, as it seems, a covering to the eggs, and which projects at this place, being partly visible through the integuments. This glandular mass connected with the female generative system is situated behind the gills, at the inner surface of the mantle.

A more complete idea of the external form of the animal may be had by comparing the two following figures. Fig. 2 represents the animal taken out of the shell from a dorsal aspect. The circumference appears oblong, and of an irregular oval form. The whole is divided into two chief parts; the first is the hood, exactly filling up the shell's aperture*; the second part was concealed in the lower and posterior part of the terminating chamber of the shell. The dorsal fold (*f'*) appears now wholly visible; it forms a thin lamellar production of the mantle, and ascends to the protuberant internal labium or amfractus of the revoluted shell. Hence the upper surface of this fold is excavated, forming the exact counterpart of the shell's protuberance. Under that fold is a smaller plate of nearly the same form, but adherent to the posterior declivous surface of the hood, and only free at its circumference. This plate is of an aponeurotic texture and a white colour: at both sides it is united to the dorsal fold, and below it seems to have an intimate connexion with the two side parts of the funnel, and indeed to be a continuation of those parts. The dorsal or superior part of the aponeurotic band, which forms, as we have said already, the continuation of the oblong side-plate (fig. 1 *g*), is here visible at *g*, *g*. Three small longitudinal bands or tendinous inscriptions (*h*, *h*, *h*) seem to give some firmness to the dorsal part of the abdominal portion of the mantle. Near the posterior end of this visceral sac, nearer however to the superior surface of it, is the beginning of the siphon (*j*); it seems nearly superfluous to say that this siphon is a tubular production of the visceral part of the mantle, protected by a calcareous covering, and penetrating by the central perforation of the several septa in all the following compartments of the shell.

At the inferior surface (fig. 3) a part of the funnel is visible in the middle of the digitations of the head. The inferior face of those digitations is of a white colour, contrasting with the brown and dark colour of the hood and of the superior surface of the digitations which are nearest to it. The free inferior and anterior margin of the mantle appears rounded and somewhat convex; it conceals the basal part of the funnel and of the appendages of the head.

More instructive is an inferior view of the animal if the mantle has

* It may be allowed to hazard here the opinion, that the two juxtaposed fossil shells, known by palæontographs as *Aptychus*, were two shelly supports of the hood of *Ammonites*, extinct Cephalopods not very different in structure from the *Nautilus*, and belonging, like that genus, to Prof. Owen's tetrabranchiate group.

been removed or reflected backwards ; in this manner the branchial cavity is visible (fig. 4).

The two overlapping sides of the funnel form a striking particularity of the structure of the Nautilus. It is interesting that the embryo in the dibranchiate group, as we learn from Dr. Kölliker's observations*, shows the funnel composed in the beginning of two lateral separate parts. The embryonic condition in the dibranchiate Cephalopods proves thus to be a persistent structure in the tetrabranchiate group.

Between the basal part of the second pair of gills the anal aperture is visible. This part has been misrepresented by Prof. Valenciennes. It seems that a longitudinal fold connecting the integuments of the viscera with the two large shell-muscles was disrupted in his specimen, and that the author believed this to be the rectum. The oviduct in this supine position is situated at the left side, before the anus, and terminates with a transverse bilabiated and protuberant aperture or vulva. [Consequently, when the animal is in its natural position in the shell, the termination of the oviduct lies at the right side.]

There are three little slits on each side at the roots of the branchiæ. The first pair of those apertures is situated at the anterior surface of the first branchia, near the posterior margin of the large shell-muscle. Between the first and second branchiæ are the two other slits, very near to each other, and at the outward side of them is a little depressed papilla, affixed to the posterior surface of the root of the first branchia. The first and the last slits are the exterior openings of two lateral blind sacs, containing the follicular appendages of the branchial arteries ; the second slit communicates with the pericardium†. At the first slit I once found a calcareous reddish-white and friable concretion ; I believed it to contain uric acid, but the chemical inquiry of my friend Prof. Van der Boonchesch has not confirmed my supposition.

Behind the anus there are on each side two small and depressed caruncles, very similar to that mammillary eminence or papilla we have seen at the root of the first branchia. External to those caruncles and behind them is a series of small orifices, not unlike to the openings of the Meybomian follicles on the human eyelids. These are the emunctories of the glandular organ, for the secretion of the covering matter of the ova.

* Entwicklungsgeschichte der Cephalopoden. Von Dr. A. Kölliker; Zurich, 1843, 4to, p. 41 etc.

† The three pairs of openings have been first observed by Prof. Valenciennes. This point of the anatomy of the Nautilus has been chiefly elucidated by the observations of my friend Prof. W. Vrolik (*Tijdschrift voor de Natuurkundige Wetenschappen, uitgegeven door de Eerste Klasse van het Koninklijk-Nederlandsche Instituut*, ii. 1849, p. 312-315). Prof. Owen describes in his memoir but one of those openings, and it is therefore questionable what opening he speaks of. It seems however to me to be the second, because Prof. Owen describes the mammillary eminence which is nearest to this slit, and chiefly because the author observes that the orifice "conducts from the branchial cavity to the pericardium." (Memoir on the Nautilus, p. 27.)

The head still requires some further description. In order to give a more correct idea of the mutual superposition of the numerous digitations and processes which exist in the Nautilus, instead of the eight or ten arms of the dibranchiate Cephalopods*, I have represented them from the left side, in three comparative figures, so as they follow each other from the exterior surface of the head to the interior covering of the mandible (see fig. 5-7).

In the first place (fig. 5), the mantle *f* being reflected, the hood (*a*), the different digitations (*c, c*), and the funnel (*d*), are visible. The large pedunculated and perforated eye (*b*) has two tentacles (ophthalmic tentacles, Owen), one before its anterior margin, the other behind, which are however not distinctly seen without reclining the surrounding parts, and bending the eye-peduncle*. Only a few tentacles are protruded from their sheaths, and partly visible. I never saw them protruded to such an extent as in M. Laurillard's figures. The number of these digitations seems not to be exactly the same in all specimens. Instead of nineteen digitations on each side, as in Prof. Owen's specimen, I twice found only eighteen. M. Valenciennes found only seventeen in his specimen. That the hood is formed according to the ingenious supposition of Prof. Owen, by two large digitations conjoined along the mesial line, has been mentioned above. The hood indeed contains two tentacles, and in this manner the whole number of exterior or digital tentacles varies from eighteen to twenty on each side.

The second layer of tentacular processes is brought into view by cutting off the hood and the external digitations. Fig. 6 gives a view of this dissection. In this figure *b* is the eye, *d* the funnel, as in the foregoing figure; *c, c* are the cut parts of the tentacles contained in the digital processes. The layer now visible is formed by that set of tentacular sheaths which Prof. Owen calls the *external* or superior labial processes (fig. 6 *k, k*). For a reason explained in the following part of my paper, I would be disposed to prefer the name of *external labial process* to that of *superior*. The membrane covering the mandibles and the muscular mass of the mouth, and terminating in the fringed lip encircling those parts, is to be seen at a little distance above this layer (at *m*), and shows numerous circular folds. Beneath this layer a small part of the third layer (*l*) is visible.

This third layer is brought into view by removing the second (see fig. 7). In this figure *k, k* are the cut parts of the tentacles of the external labial process, and *l* is the *internal* or inferior *labial process* of the left side. The folded membrane *m* is now almost wholly visible. The internal labial processus consists of a flattened stalk, which ascending expands in a compressed paddle, whose superior margin is straight and perforated for the exertion of the tentacles. There is some likeness to a glove whose fingers are cut off. The description of Rumphius mentions all the digitations and pro-

* Under the eye is a part, first noticed by Valenciennes, a little hollow caruncle, with bilabiated aperture, which seems to be the true organ of smell (see fig. 8). It is only visible by bending the eye behind and above, and adheres to the root of its stalk.

cesses as superimposed flaps, each in shape of a child's hand*. This comparison answers chiefly to the internal labial processes.

The number of tentacles in those two pair of labial processes is not exactly the same in different specimens, nor even in the same specimen at both sides. The description of Rumphius gives sixteen tentacles to the external labial processes, but does not mention their number in the internal processes. Prof. Owen found twelve tentacles, Prof. Valenciennes thirteen in each of those four processes. In the external processes Prof. W. Vrolik observed twelve tentacles on each side, as was observed also by me. The internal processes seem to have in general a somewhat larger number; Prof. Vrolik observed in this layer fourteen on each side; I found also fourteen at the left and sixteen at the right side. The external labial processes are united in the mesial line at the ventral side above the funnel by a membrane with numerous fine folds on the inside; the internal approach here nearer to each other and are united in a similar manner; the commissure presents on the inside, towards the dorsal surface, seventeen or eighteen eminent, compressed, longitudinal folds, like the parallel ridges in the olfactory cavity of Fishes. This part is, according to Prof. Owen's opinion, the organ of smell; but I believe that those folds are only rudimental digitations completing the circle of the internal labial processes, and similar to the more numerous and smaller folds of the external circle, or even to the fringed margin of the lip round the mandibles.

In respect to the observation of Valenciennes concerning the mandibles, it is perhaps not unnecessary to note that I saw them in different specimens always covered with a calcareous white matter, as has been observed in the first accurate description of the animal by my eminent friend Prof. Owen.

The sexual difference of the Nautilus requires still further elucidation. Prof. Owen's description was relative to a female, and also all the other specimens observed by subsequent authors, or preserved hitherto in the museums, seem to be of female specimens. Hence it seems to follow that males are rarer; a similar circumstance of unequal number has been noted in many other animals of several classes. The recent observations of Köllicker and some other authors having elucidated the true nature of that abnormal animal form, not unlike to separated arms of Cephalopods, found in the shell of the (always female) *Argonauta*, and formerly described as a genus of worm under the name of *Hectocotyle* by Cuvier, would lead us to expect similar males of the Nautilus living like parasites with the female in her shell. There exists however not the least indication in the different memoirs of Owen, Valenciennes and Vrolik, that such parasites were present. I can say that in Nautilus the sexual difference is not so great, and that the male lives in a shell like the female. I was fortunate enough to observe one specimen of a male, which was kindly presented to me by my colleague at the Faculty of Sciences of the Leyden University, the Professor of Botany, W. H. de Vriese. The differences it showed

* "Zijnde ieder lap gefatzoeneerd als een hand van een kind." (Amboinsche Rariteitkamer, p. 60.)

in the conformation of the head may be ascribed either to sexual difference or to monstrosity. This must remain unsettled till another male can be observed; but I incline to the first opinion, a similar aberration of structure not having been observed in any of the hitherto dissected females.

I have already described this male in a former paper*, but I believe it will not be superfluous to give here the translation of the chief matter of my Dutch memoir on this specimen, together with some additional remarks and corrections.

At the inner surface of the circle of digitations, which were eighteen at each side, without the hood, there was a prolongation of the integuments rising up to another more internal circle. This prolongation unites at the ventral side by a free and thin margin to the connecting basal part of the digitations. At the inner surface of this connexion of the external digitations, there are many transverse dimples parallel to the transverse margin of this commissure: many little holes give a reticulated appearance to this part. The prolongation becomes thicker and expands on each side in a processus divided in eight digitations of different size, including each a tentacle, similar to those contained in the external digitations of the head, but smaller, as usual in other specimens. On account of their place, those processes seemed first to me to be analogous to the *superior labial processes* of Prof. Owen's memoir, because they are situated at the dorsal side, and consequently I described them under that name in my former publication; but as they are internal or nearer to the mandibles than the other pair of similar processes, I now believe them to be analogous to the inferior labial processes in the female, notwithstanding their superior position. The fold of the integuments connecting those processes at the central side to another in the mesial line divides in two plates; the exterior adhering to the commissure of the external digitations already described; the interior united to the covering of the mandibles. Between those two plates a pair of depressed cushion-like parts is placed, coming in contact to another in the middle, and nearly wholly adherent at their inferior surface to the inner plate. They have nearly 8 lines in length and $4\frac{1}{2}$ in breadth. Their free, superior and internal margin is divided by incisions in ten or eleven small tetragonal parts; the right part having eleven, the left ten of those digitations. The relative position seems to prove them to be analogous to the folds between the internal labial processes, which are considered as the olfactory apparatus by Prof. Owen. I believe they afford an additional argument against this opinion, because they are doubtless only rudimental digitations.

Beneath those internal labial processes there is at each side outwards to them a fold in the inner surface of the external circle of digitations. At the right side a processus is exserted from this fold;

* Tijdschrift voor de natuurkundige Wetenschappen, uitgegev. door de eerste Kl. v. h. Koninkl.-Nederl. Instit. i. 1848, p. 67-75. A short abstract of this description was communicated by me at the Oxford Meeting (1847) of the British Association, and is inserted in the Report of the Seventeenth Meeting of the British Association; London, 1848; Transactions of the Sections, p. 77.

it consists of the conjunction of the sheaths of four tentacles ; three of those tentacles are placed on a common flat expansion ; the fourth is contained in a separate slip, placed beneath the three other tentacles. At the left side, instead of this external labial processus, there was a great conoid body, the length of which was nearly $2\frac{1}{2}$ inches; this part was laterally compressed ; at the basis its measure from the dorsal to the ventral side was found to be 1 inch 10 lines ; from the right to the left side only 1 inch. This part was proved to me by dissecting it to be formed by the union of four unusually developed tentacular slips, one of which was shorter and more free, the three other chiefly composing the singular body. This part occupied a great space in the interior of the circle, which was formed by the external tentaculiferous digitations of the head, and perhaps its great development may have been the cause of the more imperfect condition of the other three labial processes.

I regret that this specimen was in a bad state of preservation ; its abdominal sac being dilacerated and the viscera destroyed by maceration. Hence I am not able to give a description of the male organs of generation, but that the specimen was a male seems to me unquestionable. At the same place where in other specimens the vulva adheres to the ground of the branchial cavity, was a short conic part, evidently the penis, somewhat bent at the basis towards the ventral side, having an obtuse and perforated top. A very narrow canal was found to go from this aperture to the root of the penis, and to expand there in a pouch, of a firm parchment-like texture. This bladder contained a conglobate tube of a brown colour, having a little more than 1 line in diameter. The length of this tube could not be determined, because, by any attempt to unravel it, it broke into pieces. Microscopic investigation proved that this tube was formed by two membranes, the external transparent, the inner thicker, coloured, brittle, and offering circular stripes or fibres. In the interior of the tube there was a thread or band, coiled up in a spire with close circumvolutions, like the spiral fibre of the *tracheæ* of insects. This fibre was not of exactly equal broadness in its whole extent ; its broadest parts had a diameter of nearly 1-48th of a line. This fibre seemed composed of an external transparent membrane, including an internal part of a yellowish brown colour. Between the fibre and the tube containing it were observed several free microscopic parts ; some greater, of a brown colour, oblong or navicular ; some smaller, uncoloured, and still of different size. How different this conglobated tube, contained in the spermatic vesicle, may be from the *Needham-machines* or spermatophores of other Cephalopods, I still believe that we ought to consider it as a similar sperma-containing apparatus. It seems highly desirable that a travelling naturalist may have the opportunity of observing the male Nautilus in a recent state.

Imperfect as they are, I trust those last observations to be still of some interest for comparative anatomy, as giving the first account of that which seems now to be the chief *desideratum* in our knowledge of the Nautilus, the disposition and structure of the male generative apparatus.

EXPLANATION OF THE FIGURES.

(Published in the Transactions Z. S. vol. iv. Pl. 5-8.)

Fig. 1—8 belong to the female *Nautilus*; fig. 9—14 to the male specimen, which is described at the end of my memoir.

Fig. 1. A female *Nautilus* in its shell, from the left side.

Fig. 2. The same specimen seen from above, and taken out of the shell.

Fig. 3. The same, from below.

The following letters indicate the same parts in those three figures: *a*, the hood; *b*, the eye; *c c*, the digitations; *d*, the funnel; *ffff i*, the mantle; *i*, its visceral part; *f'*, the dorsal fold of the mantle; *g*, the aponeurotic insertion of the shell-muscle.

In figs. 1 and 3, *h* indicates the place where the laminated gland is situated.

In fig. 2, *hhh* are three aponeurotic inscriptions on the visceral sac; *j* is the siphon.

Fig. 4. Branchial cavity and funnel of the same. *f*, funnel; *g*, mantle, reflected; *ee*, shell-muscles; *hh*, first pair; *h'h'*, second pair of branchiae; *a*, anus; *b*, vulva; *c*, caruncle at the root of the first branchia; *d*, two pair of similar papillæ at the bottom of the branchial cavity. 1, 2, 3, three pair of slits (at the left side of the figure the first is to be seen; the two others are represented on the right side of the figure).

Fig. 5. Side view of the head, the mantle *f* being reflected: *a*, hood; *b*, eye; *c c*, digitations; *dd*, funnel.

Fig. 6. The same, after removing the digitations; *c c*, transverse sections of their tentacles; *kk*, external labial processes; *l*, internal ditto; *m*, membrane covering the mandibles.

Fig. 7. The same, after removing the external labial processes, cut off at *kk*.

Fig. 8. Caruncle at the peduncle of the eye; organ of smell, *a*.

Fig. 9. Head of a male *Nautilus* seen from above; the hood has been divided by a longitudinal section; *gg* are the internal labial processes; below them, at the right side, is placed and partly visible at *i*, the external labial processus. The place of it occupies at the left side a large conoid body, *a*; *mm* is the fringed lip inclosing the mandibles.

Fig. 10. The conoid body of the foregoing figure, separately seen from the inner surface, together with the incumbent internal labial processus of the left side.

Fig. 11. Lateral view of the internal labial processus of the right side, with the mandibles and the surrounding lip.

Fig. 12. View of the inferior surface of the muscular mass of the mouth, with the two cushion-like incised bodies, representing here the folds between the internal labial processes.

Fig. 13. Penis. *B*, a longitudinal section of it.

Fig. 14. A portion of the circumvoluted spermatophore or tube contained in the bladder at the basis of the penis.

Leyden, 8 Dec. 1849.

2. DESCRIPTION OF A NEW GENUS OF BATRACHIANS FROM SWAN RIVER. BY DR. H. SCHLEGEL, CURATOR OF THE ROYAL ZOOLOGICAL MUSEUM, LEYDEN. (EXTRACTED FROM A LETTER TO J. E. GRAY, ESQ.)

"The following notice I hope is sufficient to give an idea of a new Toad which was discovered at Swan River by Dr. Pries:—

"*MYOBATRACHUS*, n. g.

"Tongue small; no teeth except two small horizontal fangs in the intermaxillary bone; eustachian tubes separated, opening behind the eyes. Legs short, enveloped at the base in a duplicature of the skin

of the sides of the body. Fingers 4, the second longest; toes 5, cylindrical, tapering, not armed. Eyes lateral, middle-sized.

"**MYOBATRACHUS PARADOXUS.**

Above brownish grey, beneath greyish.

Hab. Australia; Swan River. Mus. Leyden.

The Prince of Canino has made for this animal a family, which he has named **MYOBATRACHIDÆ.**"

Mr. Gray observed, that a toad which he described and figured in Capt. Grey's Travels in Australia, under the name of *Breviceps Gouldii*, agrees with the animal described by Dr. Schlegel in all particulars, and especially in possessing the two horizontal horny appendages on the intermaxillary, which Dr. Schlegel described as horizontal fangs; they are partly sunk into the integument of the palate. Admitting the propriety of the proposed generic distinction, the animal will therefore now stand in the catalogues as *Myobatrachus Gouldii*.

The presence of the teeth in the intermaxillary separates this animal from the *Breviceps* of South Africa.

3. DESCRIPTIONS OF SOME APPARENTLY NEW SPECIES OF LONGICORN COLEOPTERA IN THE COLLECTION OF THE BRITISH MUSEUM. BY ADAM WHITE, F.L.S., ASSISTANT IN THE ZOOL. DEPT. BRIT. MUS.

(Annulosa, Pl. XIII.)

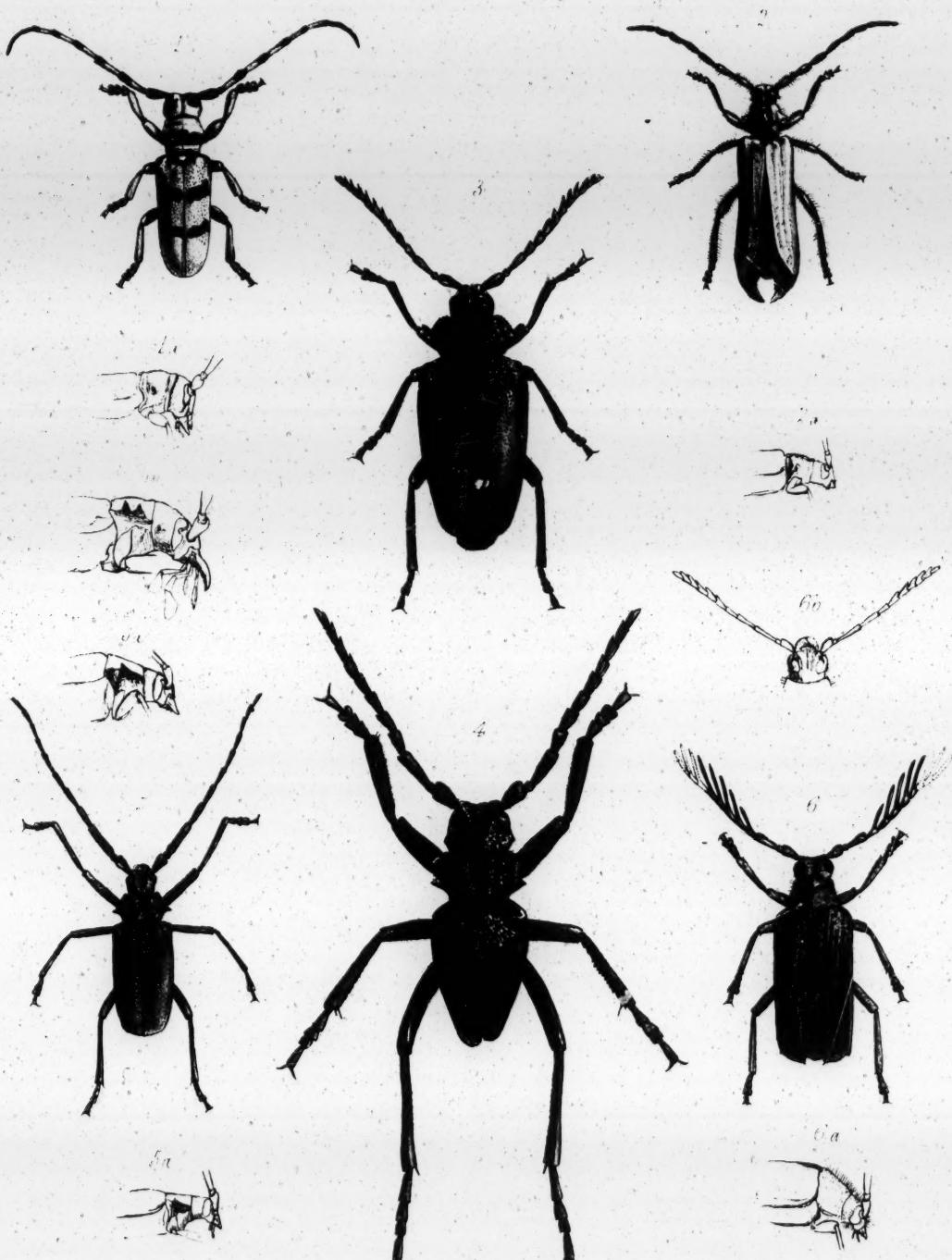
PRIONACALUS ATYS. Pl. XIII. fig. 4.

In the 'Annals and Magazine of Natural History,' vol. xv. p. 108, I have described under the name of *Prionacalus Cacicus*, a curious genus from Mexico, allied to *Psalidognathus*, G. R. Gray. I regarded the two specimens as male and female of the same species, but it would seem that they are both males, and as they are considerably different, must be different species; what was deemed the male may retain the name *Prionacalus Cacicus*; it is figured on plate 8. fig. 1. of the above volume. The other specimen may be named *Prionacalus Iphis*; it is figured on plate 8. f. 2. Since the above we have received a third species from the Andes of Peru, where it was found by Prof. Jameson of Quito; the following short specific characters may distinguish the three:—

P. CACICUS.

Head behind the eyes without a prominent spine, the lateral margin behind, produced into a slight process directed backwards; a strong crested ridge over each eye, at the end directed outwards; antennæ, palpi and legs rufous, antennæ blackish at the base; jaws, excepting at the end and on the edges (where they are smooth) roughly punctured: head, thorax and elytra, at the base, somewhat roughly punctured, the elytra more delicately punctured towards the end.

Hab. Mexico.



1. *LAMIA(CEROSTerna) TRIFASCIELLA* 2. *BIMIA BICOLOR*. 3. *COLOCOMUS MOROSUS*.
4. *PRIONACALUS ATYS*. 5. *PYRODES TENUICORNIS*. 6. *CALLOCTENUS PULCHER*.



P. ATYS.

Head midway between the eyes and the hind margin, with a small wide spine ; a slight, crested, straight ridge over each eye, the space between slightly grooved ; antennæ thickish. In colour it is of a dark pitchy brown ; the apex of the elytra somewhat ferruginous ; legs pitchy brown ; tarsi and tips of tibiæ ferruginous ; palpi of a clear ferruginous : sculpture much as in last.

Hab. Andes of Peru.

P. IPHIS.

Deep black, coarsely punctured and rugose ; antennæ at the ends, palpi, tibiæ at apex and tarsi reddish ; head midway between the eyes and hind margin, with a strong wide spine on each side ; head with the two keels over the eyes short and straight, the space between them deeply grooved.

Hab. Mexico.

CALOCOMUS MOROSUS. Pl. XIII. fig. 3.

Antennæ ferruginous, black at the base ; 13-jointed, very strongly serrated on the outside, the terminal joint deeply notched, nine at least of the terminal joints with the outer edge elongated at the tip : head, thorax, scutellum, abdomen and legs pitchy black ; head, thorax and scutellum thickly punctured ; elytra thickly and finely punctured, the punctures of the base coarser ; elytra wide, shorter than the abdomen, ferruginous, in some places darkish brown.

Hab. Bolivia. From the Collection of Mr. Bridges.

This makes the fourth species of *Calocomus*, a genus which seems, like some of the other *Prionidæ*, to be very variable in the number of joints in the antennæ ; the type *C. Desmarestii* has eleven joints ; this species has thirteen ; while the *Calocomus Lycius*, and *C. Kreuckelyi*, described by M. Buquet, have no less than twenty-two.

PYRODES TENUICORNIS. Pl. XIII. fig. 5.

Head and thorax deeply, coarsely and irregularly punctured, washed with golden green, in some lights tinged with a deep purplish rufous ; jaws golden green, tips and edges pitchy ; antennæ with the first joint flattened above, golden green except at the end, which is bluish green ; third joint much elongated, as long as the fourth and fifth taken together ; the first six joints punctured, base of the seventh punctured, tip of the seventh joint and the whole surface of the terminal four grooved. Elytra varied with green and purplish red, much depressed, the margin and shoulders lively green ; scutellum notched at the end, slightly grooved down the middle, and with a patch of coarse punctures on each side of the groove. Under parts green with aeneous reflections.

Femora green and covered with minute crowded warts ; tibiæ and tarsi light rufous, the tibiæ with elongated papillæ and short hairs.

Hab. Mexico.

Of this species there are two examples in the Museum ; in the one figured a purplish red tint pervades all the joints of the antennæ but

the first, and extends over the whole elytra excepting on the basal margin and the extreme edge, which are green.

This species seems to link the three genera *Pyrodes*, *Mallaspis*, and *Solenoptera*; it agrees in most particulars with *Pyrodes*.

PYRODES SMITHIANUS.

Scutellum considerably elongated at the point and notched at the base, the shoulder and the elytra close to the scutellum are produced, and near the shoulder there is a deep groove. The head and thorax are rather smooth and closely punctured; the front margin of the thorax is slightly notched in the middle; the scutellum is quite smooth on the edges, down the middle, and at the tip; the elytra are roughly punctured, the punctures often running together and forming characters like letters; there are four longitudinal ribs down each, which are branched at the end.

This *Pyrodes* is of a bronzy copper colour, the tibiæ and most of the joints of the antennæ being tinged with purple.

Hab. Brazil.

A specimen was found by J. P. George Smith, Esq., of Liverpool, on Caripi, an island thirty miles from Para: he presented it, with numerous other fine insects, to the British Museum.

CALLOCTENUS, n. g.

Body small, the elytra extending over its side and considerably beyond its extremity. Head much excavated in front. Eyes large and prominent. Thorax with a distinct tooth on the sides a little beyond the middle. Scutellum of an elongated triangular form, pointed at the end. Elytra spined at the suture and at the end of the lateral margin.

Antennæ in the male pectinated from the fourth joint, in the female serrated from the fifth: in the male the first joint is of the same length as the fourth exclusive of the appendage; the third is considerably elongated and with a protuberance at the end; from the fourth to the eighth the end is furnished with a compressed appendage narrow at the base, dilated afterwards and blunt at the tip (the ninth and other joints broken off). Antennæ in the female with the terminal joints depressed, oblique at the end, so that the inner edge is serrated. Legs moderate, simple, without serratures. Elytra spined at the suture and at the end of the lateral margin.

This genus comes between *Paeilosoma* and *Anacolus*.

CALLOCTENUS PULCHER. Pl. XIII. fig. 6.

Hab. Venezuela.

Head, thorax, scutellum and under side of body of a dark coppery green, the head and thorax rather thickly covered with soft greyish yellow hairs; elytra with three longitudinal, considerably raised keels, between each of which is a slighter keel; in the male these latter are abbreviated, between the keels the elytra are closely punctured; the elytra in the male are of a brownish yellow, the punctured parts, except at the base, being darker in colour; in the female the elytra are

of a clear ochre yellow; in the male the antennæ are of a dull ferruginous, the base of the joints paler; the legs are ferruginous in the male, while in the female they are of the same dark coppery green as the head and thorax.

In a female specimen the elytra are of a very dark olive-green; the specimen is rather larger than the other.

Sent from Venezuela by Mr. David Dyson of Manchester.

BIMIA, n. g.

Head as wide as the thorax in front, somewhat narrowed behind, in front square and nearly perpendicular, grooved down the middle; jaws short and strong; eyes deeply notched for the insertion of the antennæ, the hinder margin widely sinuated.

Antennæ 11-jointed, shorter than the body; first joint clavate, cylindrical, slightly longer than the third; second joint small, moniliform; third, fourth and fifth joints straight, compressed, and nearly of the same length; the sixth slightly bent and compressed; the five last joints compressed and gradually smaller, the last blunt at the tip. Thorax wider than long, with a strong spine on each side about the middle, its disc depressed and slightly unequal. Scutellum largeish, hollowed slightly in the middle. Elytra rather narrow, not so long as the abdomen, soft, not meeting except at the base; the shoulders prominent, the sides nearly parallel, the ends slightly pointed; the wings large, and extending beyond the elytra and abdomen. Legs strong, slightly compressed; femora somewhat thickened; hind legs, if extended, would reach a little beyond the abdomen. Tarsi scarcely wider than the tibiae; penultimate joint deeply cut; soles densely covered with short hairs.

This genus would seem to be placed not far from *Molorchus*, and may be allied to *Agapete*, Newman, Zoologist, iii. p. 1017: it is not unlikely that the other sex is very different in form and colour; there is only one specimen in the Museum.

BIMIA BICOLOR. Pl. XIII. fig. 2.

Hab. Australia (Perth). From the Collection of Mr. George Clifton.

The body is of a very deep shining black, closely punctured, and furnished with short hairs; head below and in front yellow, the yellow colour extending triangularly between the antennæ; eyes, antennæ, cheeks and vertex black; thorax yellow, with a black band down the middle, contracted behind; scutellum black; legs of same deep black as the abdomen, a wide yellow ring on the front tibiae near the top; elytra pale ochre yellow, with three or four longitudinal veins which branch towards the tip; wings long and black.

LAMIA (CEROSTERNA) TRIFASCIELLA. Pl. XIII. fig. 1.

Densely covered with short yellow and black hairs; head yellow, an impressed line along the middle free from hairs; antennæ with the two first and four last joints black, the other joints yellow at the base and black at the tip; thorax yellow; spines and a band connecting them black, the band crenated in front; legs yellow, joints, tarsi

and posterior side of second and third pairs of femora black; scutellum at the end covered with yellow hairs; elytra of a clear ochre yellow, the base from the shoulder to the suture edged narrowly with black; a transverse black band before the middle, nearly but not quite touching the edge and the suture, widest toward the suture; another transverse black band just behind the middle, and neither touching the edge nor the suture, narrower than the first band, and, like it, waved both in front and behind.

Hab. China (Hong Kong). John Bowring, Esq.

This seems allied to the *L. Assamensis*, Hope. In the present unsettled state of the Longicorn Coleoptera it would be rash to found genera on mere isolated species; but it is difficult to refer the present to any of the modern genera; it comes perhaps nearest to *Cerosterna*.

The figures represent the insects of the size of nature.

January 22, 1850.

Matthew Truman, Esq., M.D., in the Chair.

The following papers were read:—

1. DESCRIPTION OF A NEW SPECIES OF CHRYSDOMUS,
FROM THE MOUTH OF THE MACKENZIE RIVER.
BY J. E. GRAY, Esq., F.R.S. ETC.

(Mollusca, Pl. VII.)

Sir John Richardson, M.D., on his return from the Arctic searching expedition, kindly presented to the Museum a series of shells which he had collected between the mouth of the Mackenzie River and Cape Parry: several of them were broken by the extreme cold during the wintering of the expedition at Great Bear Lake.

The collections consisted of the new *Chrysodomus* here described, and the following species, which are exactly similar to the species brought home by Ross, Parry, and the other arctic voyagers from Baffin's Bay, and are interesting as showing that these species are found more than half-way towards the Northern Pacific Ocean; viz.

Saxicava arctica. Very like *S. rugosa*, but larger.

Hiatella arctica. Very large size, with the hinge-teeth almost entirely obliterated.

Mya truncata.

Glycimeris siliqua. All young.

Cardium Grænlandicum. On the shores.

Crassina semisulcata, Leach, not Müller. In the mouth of the river: eaten by the birds.

Buccinum glaciale.

The egg of a large species of *Natica* was abundant on the sands, probably *N. ampullaria*, Lamk.?

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CHIROSTOMUS HEDYLO



CHRYSDOMUS HEROS. (Mollusca, Pl. VII.)

Shell elongate; spire conical, longer than the mouth; whorls convex, two or three upper with a strong central keel, rest with irregularly placed distant rounder tubercles, the last rounded, not keeled; throat white.

Var. 1. Whorls as with a strong, central, continuous keel; the last slightly nodulose.

Egg-cases ovate-oblong, erect, on an expanded base, contracted beneath; surface deeply punctated, granular.

Inhab. Arctic Ocean.

This shell is very like *Chrysodomus despectus*, but differs from that species in the form and surface of the egg-cases, as well as by the greater convexity of the whorls, and the strength and angularity of the keel on the upper whorls.

Like the other species of the genus, the white, opaque, outer coat of the shell is very much inclined to separate from the inner or central coat, which presents, where the outer coat is removed, a smooth surface of yellowish or brown colour.

Dr. Richardson observed several specimens of this shell in the sand-hills which edge the coast, some distance from the sea.

I have named this species *Heros*, as being finest of the genus, and in commemoration of the enterprise and heroic conduct under great hardship of its discoverer.

2. REMARKS ON THE MORPHOLOGY OF THE VERTEBRATE SKELETON. BY EDWARD FRY.

The objects of the present paper are,—1st, the brief statement of the probability that there are laws which govern animal form, in addition to the law of final causes; and 2nd, the *à priori* discussion of certain propositions about the vertebrate skeleton; being an attempt to illustrate the vertebrate by some invertebrate forms, and thus to show their unity of plan.

SECTION I.

The existence of laws governing animal form is rendered probable by the discovery of such laws as regards the forms of plants, all whose parts may be referred to a leaf as the fundamental archetype, as is shown not only by the correspondence in many normal conditions, but also by the transmutations of parts, and the monstrosities to which the petals, sepals, stamens, &c. are liable. Though the greater simplicity of plants, and the more numerous monstrosities to which they are liable by nature or art, render the existence of laws of the kind spoken of more readily apparent in them than in animals, the nature of the proofs and of the conclusions are alike in both cases.

It may, secondly, be remarked, by way of showing a general probability for such a scheme, that there exist unities of structure both in different animals and in different stages of development of the same animal, which are independent, so far as we know, of unity of

end ; or, in other words, that final causes do not explain all the affinities and resemblances which we are able to trace*.

And again, it must be observed, that those remarkable likenesses, which are observable in many or all animals, between their various forms and conditions up to maturity, on the one side, and the various members of the animal kingdom up to their own position in the scale, on the other hand (so that, for instance, man passes through forms resembling, but not identical with, those of many animals from the lowest monad up to his own position in the scale), are inexplicable on the theory that the forms of animals are regulated by final causes only ; but are in perfect accordance with that other which holds that there is expressed in the structure of animals some abstract idea, which running through all the frame, and modified to all purposes of need, and manifested in all variety of conditions, is yet one and the same.

It must be admitted that the force of these arguments may, to some extent, be barred by an assertion which it is difficult fully to answer, viz. that our ignorance of final causes is so great as to allow us no room to argue on the existence of other causes from their apparent inadequacy ; nevertheless as the other supposition seems to have in it no improbability, but as I think the contrary, it may be admitted as at least what best suits our present knowledge.

The belief in the existence of other laws of organization besides that of final causes does in no wise lessen or obscure the argument of natural religion derived from it, which was advanced with great pertinency by the ancient Stoical philosophers, and has been amplified by Derham, Paley and others in our own country.

I now proceed to the second portion of my paper.

SECTION II.

There are reasons derived from the structure of animals below the Vertebrata which might induce us to expect that the vertebrate skeleton should be composed of elements of a common character.

1. So soon as the nervous system assumes the form of a line or chain down the body of the animal, the whole structure puts on a segmental or annular arrangement. Thus in the Annelida the body consists of numerous segments, similar one to the other, with the exception of the anterior one or head, which is sometimes slightly different in form, but in other instances only distinguishable by the presence of a mouth. Each segment has its proper nervous ganglion, connected by two fibrous commissures with those of the neighbouring division.

2. But these segments are subject to change. Thus the *Polydesmidæ*, a family of the Myriapoda, exhibit the posterior part of the body composed of segments similar to those above described, whilst in the anterior part each segment is the result of the coalescence of two original ones. In the Chilipoda, the same process has

* This part of the subject has been fully illustrated by Prof. Owen in his various writings.

gone on further; so that all the apparent segments are thus composed by the ankylosis of two original ones at an early period of growth, as proved by the two pair of legs which each one bears, and the double nervous ganglia which they contain, the nervous centres of the original elements having approximated to one another without coalescence (Newport on Myriapoda, Phil. Trans. 1843).

3. But not only does the progression from lower to higher forms in the scale of the animal kingdom teach us how segments of the body originally similar may be changed—the progression of individuals does the same thing. The larval condition of insects undoubtedly corresponds very nearly with the Annelida; the arrangement of the body and the relation of each segment to the nervous system are similar. But the perfect state shows a very great modification in the form; many segments have disappeared by coalescence, whilst the equality of size originally existing between them has been lost by reason of the centralization of functions; the nervous centres have often been removed from their respective segments, yet the number remains the same; for although only nine centres appear in the abdomen (Blanchard sur les Coleoptères, Annales des Sciences Naturelles, 1846, part i.), yet the last has been shown in the Lepidoptera (Newport on *Sphinx*, Phil. Trans. 1832) to consist of two which have united.

4. The same segmental arrangement of the body, and the same ganglionic condition of the nervous centres in accordance with the rings of the body, obtain throughout many members of the class of the Articulata.

We now descend to two more particular propositions, resulting from and embraced in the foregoing, but which we nevertheless prefer to illustrate separately.

There are reasons to expect that the head of the Vertebrata should be composed of segments similar to those of the body.

1. We have already noticed the close resemblance between the anterior segment or head and the following ones in the *Polydesmidæ*.

2. In the larval insects the similarity is great; but in the perfect one a number of the other segments become ankylosed, and enter into the composition of the head, in accordance with the law, that the more perfect an animal is, the more complex and individualized are its parts, and consequently the more is its abstract nature hidden under its teleological manifestation. The divisions between the segments entering into the composition of the head sometimes remain permanently recognizable in the external skeleton. The number of these segments has been a much-vexed question among entomologists, the numbers advocated by different naturalists having been two, three, four, five and seven. I am inclined to believe the real number of these segments to be four:—1st, because of the very slight evidence for the presence of any other, the fifth segment being considered as entirely atrophied, and no corresponding manducatory organ appearing; 2nd, from four being the only number at all discoverable in some insects, as in the *Hydroüs piceus* (see Newport on Insecta in Todd's Cyclopædia); 3rd, because the brain (*i. e.* the coalesced

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ganglia of the cranial segments) of the *Necrophlagæophus longicornis* has been discovered by Newport, at the period of its bursting its shell, to consist of four double ganglia (Newport in Phil. Trans. 1843).

We next consider the reasons for supposing that the organs composing the mouth of the Vertebrata should be the homologues of those of locomotion. It must be remarked, that everything now to be said assists most strictly in support of the preceding proposition, and would have been introduced under that head but for the sake of convenience in illustrating the vertebrate skeleton.

1. In the Crustaceans the jaws differ in scarcely any other character than size from the true legs used in locomotion.

2. In the Myriapoda the members of the basilar segments of the head are jointed and retain the form of true legs, but are used for prehension (Newport in Todd's Cyclopædia).

3. In Insects the tarsal joints of the cranial legs are undeveloped; the femur and coxa are small or confluent with the under side of the segment, whilst the tibiæ are alone enormously enlarged, and thus become elements in the complex mouth of Insects; their muscles, however, being attached to the basilar and posterior lateral parts of the head, just as if they still subserved the purposes of locomotion (*idem*).

4. All the parts of the complex mouth of Insects are thus referable to the segments of the head. In the Great Water Beetle this is clearly shown; the manducatory organs visibly resemble the proper organs of locomotion, and are articulated to the distinct segments (*idem*).

5. We must remark intermediate normal conditions between the true locomotive and manducatory form of leg; as in the genus *Onitis*, where the prothoracic legs are without tarsi, and the tibiæ are terminated by sharp hooks; and in the *Bubos bison*, a species of a neighbouring genus, where the tibiæ strongly approach in form the proper mandibles of the head: also,

6. A monstrous condition in a specimen of *Geotrupes stercorarius*, where the prothoracic legs were arrested in development and the tarsi were absent, so that they very closely resembled the form of the mandibles (*idem*).

SECTION III.

The spinal cord of the Vertebrata is homologous with the ganglionic cord of the Articulata.

1. The elements of the systems are alike, being in both cases cellular nervous matter and commissural fibres.

2. The experiments and investigations of recent physiologists have proved the real independence of the segments of the cord contained in each vertebra, insomuch as each performs separately from the others its own reflex actions, just as is the case in the ganglionic cord of the Articulata; so that, as far as its reflex actions are concerned, the cellular or dynamic element of the spinal cord is not one organ or centre, but a series of independent organs or centres, as is seen in

the Insects, the external longitudinal fibres serving only as commissural or communicating portions.

3. Those ganglia of the Insects which are perfectly separate in the larval condition often exhibit a tendency to fusion in the perfect condition (Blanchard *ut antea*). Thus in the Coleoptera the last abdominal ganglion is always formed by a fusion of several original ones; the first and second abdominal often form a single mass with the metathoracic, whilst in the Chafer this last is united with the mesothoracic (*idem*). In like manner the fourth and fifth segments in the perfect insect are fused together. In the *Polydesmidæ*, the two first segments which bear legs unite their nervous centres with the first suboesophageal, so as to form a short cord similar to that of the Ostracion and some other fish (Newport on Myriapoda, Phil. Trans. 1843). In the Scorpion the fusion has gone so far as to form a sort of medulla oblongata, giving rise to eight pairs of nerves (*idem*). In *Nitidula ænea* all the abdominal ganglia have united to form a short cord (Blanchard *ut antea*, plates); and in *Calandra palmarum* the ganglia of the whole body have approximated so as to form a continuous moniliform cord (so far ganglionic in appearance as that the distinction between the segments has not been obliterated), which is placed in the anterior portion of the body (*idem*, plates).

4. The ganglionic cord of Insects undergoes the same alteration at its posterior extremity that the spinal cord of the Vertebrata does by its withdrawal from the caudal vertebræ and the formation of a cauda equina, as may be clearly seen in Blanchard's plates (*ut antea*, e.g. in the *Nitidula ænea*, the *Calandra palmarum*, and the *Dyticus marginalis*).

5. In the Chilognatha, or higher order of the Myriapoda, the ganglia coalesce so as to form a uniform spinal cord, the commissural fibres no longer occupying intervening spaces as in the Chilipoda, but forming the external layer of the nervous cord (Newport on Myriapoda, Phil. Trans. 1843):

6. Whilst the true vertebrate fish *Orthagoriscus mola* exhibits exactly an opposite character in the ganglionic condition of its myelon (Owen's Lectures, ii. 173, on the authority of Arsaki).

SECTION IV.

A vertebra is the correlative in the osseous of a centre in the nervous system.

This appears to me to be the most general possible definition of a vertebra, and therefore the most philosophical. The general idea of the relation of the osseous and nervous centres involved in it, though not the relation of the segments of each one to the other, was thus expressed by Oken: "Bones are the earthy, hardened, nervous system; nerves are the spiritual, soft, osseous system—*Continens et contentum*" (quoted by Owen, Report of Brit. Assoc. p. 242).

1. The number of vertebræ constituting the spinal cord always corresponds with the number of segments in the cord as indicated by

the number of pairs of nerves given off. When more than one pair perforate one piece of bone, it results from an ankylosis of several vertebræ, as in the sacrum; and the coccygeal vertebræ, which appear to be an exception to the definition, are not so in reality, the spinal cord passing into them in the foetal condition, and being gradually withdrawn just in the same manner as is the case in some of the Coleoptera. As is clearly seen in them, too, the cauda equina represents the nerves of the vertebræ from which the cord has been withdrawn. Some Vertebrata, as *e. g.* the Python, retain the original relation of the vertebræ and centres throughout the whole of the spinal cord (Owen, Report *ut antea*, 221).

2. The same dependence of the vertebræ on the nervous centres is shown by the fact, that the tail which is reproduced by Lizards, in the case of the loss of that member, is a single bone, because although bone may be reproduced, the spinal cord cannot be (Owen *ut antea*, 254).

3. In accordance with this definition may also be cited the very long vertebræ which is formed on that part of the spinal cord of the Anourous Batrachians which does not give off nerves, and which is not the result of ankylosis of several elements, but arises from one point of ossification (Martin St. Ange, Recherches anatomiques et physiologiques sur les Organes transitoires et la Métamorphose des Batraciens, Ann. des Sci. Nat. No. xviii. p. 401); and also the invariableness of the number of the vertebræ in the Mammalian's neck, resulting from the presence of the same number of nerves, and irrespective of the length of the vertebræ.

SECTION V.

A segment is the representative in the Articulata of a vertebra in the Vertebrata.

This view has been advocated by Geoffroy St. Hilaire, both in his "Mémoire sur la Vertèbre," in the ninth volume of the 'Mémoires du Muséum d'Histoire Naturelle,' and previously in a memoir read by him before the Academy in 1820. Nevertheless, the argument on which I would mainly rest it, is not yet universally admitted, for we find M. Emile Blanchard very recently asserting that nothing really indicates the analogy between the spinal cord of the Vertebrata and the ganglia of the Articulata.

1. We have seen what a close relation of correspondence exists in the Articulata between the segments and the ganglionic nervous centres; and we have endeavoured to prove that in the Vertebrata a vertebra is the correlative of one of the spinal nervous centres; and also that the spinal cord of the one class is the representative of the ganglionic cord of the other; whence it appears, that a segment of the Articulata and a vertebra of the Vertebrata must be homologous.

2. The ossification of the centrum of a true vertebra is first peripheral, and subsequently fills up the interior with osseous matter (Owen *ut antea*, 256). Thus if we suppose a vertebra stopped in the first stage, and forming the external instead of the internal sup-

port of the body, we have a segment of an articulate creature, with only an histiological difference, which must by no means be allowed to conceal from us the true nature of a part (Geoffroy St. Hilaire, *Sur la Vertèbre, ut antea*, p. 92).

3. If to this view it should be objected, that the including in the one case what is excluded in the other dispels all semblance of homology, it must be answered—

a. That notwithstanding this difficulty, the general homology of the vertebrate and articulate skeletons as wholes has long been admitted, though this more particular one of their parts has not been.

b. That the haemal arch of the Vertebrata, whose normal office it is to enclose the main blood-vessels of the body, and which office it exclusively performs in many cases, is yet in others so developed as to enclose a mass of viscera, viz. in the thorax.

γ. In the Testudina we have an example of those vertebral elements which are usually internal, becoming external, and including not only all the viscera, but having the whole muscular system attached internally, as in the Articulata, and even the limbs arising from the inside instead of the outside of the thorax.

4. It presents no difficulty that the segments of the Articulata have no superior or inferior arches like vertebræ, because both the spinal cord and circulatory organs which those arches are respectively designed to protect are included within the body (*St. Hilaire ut antea*, p. 102).

5. To the order of development of a vertebra in the lateral processes for locomotion being produced subsequently to the body, we have an analogous case in that the Myriapoda are at birth and for some time afterwards apodal, and subsequently acquire their numerous legs (Newport on *Myriapoda*, Phil. Trans. 1841). This is also the case with some other articulate animals.

SECTION VI.

The brain of the Vertebrata is a modification of a series of four ganglia homologous with those of the spinal cord.

1. In the *Amphioxus* that part of the cord which must be regarded as the homologue of the brain, because it gives off five pairs of cephalic nerves, is only distinguished from the other part of the cord by its pointed anterior extremity, its posterior part being entirely like the other ganglia; even its greatest vertical diameter is not greater (De Quatrefages on *Amphioxus*, Annales des Scien. Nat., third series, vol. iv.).

2. We have already noticed that the two large cephalic ganglia of the Centipede are the result of the coalescence of a series of four ganglia, as they appear in the foetal condition, each of these nervous centres supplying nerves to the senses. Closely corresponding with this arrangement is that displayed by many of the fish, as *e. g.* the Eel, where the brain is only a series of four closely arranged ganglia. And this same original scheme seems to me traceable throughout all the Vertebrata to man himself. There are, however, as the great

centralization and individuality of the organ would lead us to expect, many variations and modifications, which tend at first sight to conceal its real nature, as *e.g.* the removal of the olfactory ganglia to a great distance from the other elements of the brain, with which they only maintain their connexion by means of filiform crura, as in the Whiting and many fish; the amplification of the segments of the encephalon by the addition of supplementary ganglia, as the hypophysis, hypophysis, &c. as they occur in many fish, and some of which are retained in the higher orders, or the cerebrum in the cartilaginous fishes, and in all animals upwards to man, and which comparative anatomy teaches us is only to be considered as a special appendage to or development of the prosencephalic ganglia; or the extreme development of one pair of ganglia so as to obscure the others, as the cerebellum in the Sharks, Sawfish, &c. (Owen's Lectures, ii. 175); or the very diminutive size of a segment, as the cerebellum in many reptiles; or the coalescence of the pair, and consequent obliteration of the mesial division, just as is equally the case between the two halves of the spinal cord, as in the cerebellum.

3. Embryonic anatomy, too, comes in to strengthen the conclusion of comparative anatomy, that a series of four ganglia is the essential element of the brain, and that all the other parts of which it consists in adult life of the higher Vertebrata, including of course the cerebrum, are superadded.

The argument of the preceding sections, exclusive of Section I., and the conclusion to which it is intended to lead, may thus be stated:—

Considering that the head of the Insecta, Myriapoda, &c. is composed of a series of segments serially homologous with those of the body, as its brain is of ganglia serially homologous with those of the cord; that a vertebra is the general homologue of a segment as the spinal cord is of the ganglionic cord; and that the brain of the Vertebrata consists of a series of four segments; there appears a strong probability that its head in like manner shall consist of a series of four vertebrae.

3. MONOGRAPH OF THE SPECIES OF MYOCHAMA, INCLUDING THE DESCRIPTIONS OF TWO NEW SPECIES FROM THE COLLECTION OF H. CUMING, ESQ. BY ARTHUR ADAMS, R.N., F.L.S. ETC.

(Mollusca, Pl. VIII.)

MYOCHAMA, Stutchbury.

Testa inaequivalvis, adhaerens; valva affixa dentibus duobus marginalibus, divaricatis, ad umbonem disjunctis, foveola trigonid intermedio alteram testaceæ appendicis extremitatem, cartilagine corneâ connexam, excipiente; valva libera dentibus duobus inaequalibus, parris, divaricatis, altera appendicis extremitate foveolæ intermediae inserta; umbones valvæ liberæ internè, alterius externè, recurvi; impressiones musculares duæ orbicularis,

distantes, laterales; impressio muscularis pallii sinu brevi lato; ligamentum tenue externum.

Shell inequivalve, adhering; the attached valve with two unequal diverging marginal teeth, separated at the umbo by a triangular pit in which one end of a testaceous appendage is inserted and connected by a horny cartilage; the free valve with two unequal, small, diverging teeth, close under the umbo, in which is inserted the other end of the testaceous appendage; the umbo of the free valve is curved inwards, that of the fixed valve outwards; muscular impressions two, nearly orbicular, distant, lateral; palleal impression with a short broad sinus.

MYOCHAMA ANOMIOIDES, Stutchbury. *M. testá rosed, tenui, fragili, costis prominentibus radiantibus dichotomis; valvá liberá valdè convexa; umbone extra apicem valvæ alterius producto; epidermide tenui pellucida.*

Long. $\frac{11}{12}$; lat. $\frac{5}{12}$; alt. $\frac{9}{12}$.

Hab.

Shell rose-coloured, thin, fragile, ornamented by prominent radiating dichotomous ribs; free valve extremely convex, the umbo projecting beyond the apex of the other; epidermis thin and transparent.

Hab.

This species is always regularly radiately ribbed, but when found attached to smooth shells the ribs are smooth, but if fixed to *Trigonia pectinata* they are crossed by tubercles.

MYOCHAMA TRANSVERSA, A. Adams. *M. testá inaequilaterali transversá fuscá, subquadratá, anticé longiore posticé breviore subtruncatá, radiatim costatá, costis subnodosis interdum dichotomis, concentricé minutissimè striatá, valvá liberá subconvexá, umbone extra apicem valvæ alterius producto.*

(Mollusca, Pl. VIII. fig. 1.)

Shell inequivalve, transverse, light brown, subquadrate, anteriorly longer, posteriorly shorter and rather truncated, radiately ribbed, ribs rather nodulous, sometimes divided in two, very minutely concentrically striated, the free valve rather convex, with the umbo produced beyond the apex of the other valve.

Hab. Cape Upstart, 8 fathoms; *Mr. Jukes.* (Mus. Cuming.)

MYOCHAMA STRANGEI, A. Adams. *M. testá luteá, tenui, fragili, corrugatá, costis nodosis, non distinctis, concentricé striatá, lineis radiantibus asperis ad marginem ventralém distinctioribus; valvá liberá depresso umbone plano cínerascente non extra apicem valvæ alterius producto.*

Hab. in Australasiâ. (Mollusca, Pl. VIII. fig. 2.)

Shell yellow, thin, fragile, corrugated, ribs nodulous, not distinct, concentrically striated, with rough radiating lines more distinct towards the ventral margin; the free valve depressed, ash-coloured, flattened, not projecting beyond the apex of the other valve.

Hab. Port Jackson; *Mr. Strange.* (Mus. Cuming.)

4. DESCRIPTION OF NEW SPECIES OF THE GENUS CUMINGIA,
WITH SOME ADDITIONAL GENERIC CHARACTERS.
BY ARTHUR ADAMS, R.N., F.L.S. ETC.

(Mollusca, Pl. VIII.)

CUMINGIA, G. B. Sowerby.

Testa bivalvis, inaequilateralis, aequivalvis, latere antico rotundato, postico hiante subacuminato; dentibus, cardinali, in utræque valvæ unico, parvo antico, lateralibus in alterâ valvâ ad utrumque latus uno, valido, in alterâ nullo; ligamento interno foreolæ subcochleariformi affixo; impressionibus muscularibus dualibus lateralibus distantibus, antice irregulari oblongâ, postice subrotundatâ; impressione musculari pallii sinu maximo.

Shell ovate, inequilateral, equivalve; a shallow spoon-shaped cardinal tooth and a single small tooth by its side in each valve, a strong lateral tooth on both sides in one valve only; paléal impression with a large sinus, posteriorly gaping.

All the species of this genus gape more or less posteriorly, are more or less lamellose, and the cavity for the cartilage is spoon-shaped and projects into the cavity of the valves, differing in this respect from *Amphidesma* or *Semele*.

CUMINGIA SIMILIS, A. Adams. *C. testâ subtrigonalis-ovata decussatè striata, lineis transversis concentricis, lamella unica prope marginem ventralis antice latiore rotundata supra angulata postice angustiore subrostrata, area posticâ clausa, lunula lanceolato-orata, margine ventrali posticè coarctata.*

Hab. in Borea-Occidentali Ora Americæ. (Mollusca, Pl. VIII. fig. 4.)

Shell triangularly ovate, decussately striated, lines of growth transverse and concentric, rather strongly marked, a single lamella near the ventral margin, anterior side the widest, rounded in front and angulated above, posterior side narrower, somewhat beaked posteriorly, area closed, lunule lanceolately oval, ventral margin posteriorly contracted.

Hab. N.W. coast of America. (Mus. Cuming.)

CUMINGIA CLERII, A. Adams. *C. testâ orata compressâ subaequilaterali, albâ, opacâ, sublævi, nitida, striis transversis concentricis alveolisque irregularibus, latere antico angustiore rotundato, postico latiore, margine ventrali integro arcuato.*

Hab. ad Taleuhano, Chili. (Mollusca, Pl. VIII. fig. 3.)

Shell ovate, compressed, subequilateral, white, opaque, rather smooth and shining, marked with faint transverse concentric striae, and numerous pits irregularly disposed, anterior side narrower and rounded, posterior side wider; ventral margin entire, arcuated.

Hab. Found at Taleuhano, Chili, by Capt. Clery, French Marine, attached to fuci in shallow water. (Mus. Cum.)

CUMINGIA ANTILLARUM, A. Adams. *C. testâ ovato-trigonali, concentricè lamelloso; lamellis subdistantibus, interstitiis valde*

longitudinaliter striatis, latere antico breviore latiore rotundato, postico longiore, angustiore subrostrato, valde hiante, marginē ventrali postice subsinuato.

Hab. In Indiâ Occidentali.

Shell ovately triangular, concentrically lamellose, lamellæ rather wide apart, the interstices with distinct longitudinal striae, anterior side shorter, wider, and rounded, posterior side longer, narrower and somewhat beaked, widely gaping, ventral margin posteriorly rather sinuated.

Hab. West Indies. (Mus. Cuming.)

CUMINGIA FRAGILIS, A. Adams. *C. testā transversā ovali albā fragili subpellucidā concentricè lamellosā; lamellis elevatiusculis, subdistantib is, interstitiis tenuissimè longitudinaliter striatis, latere antico latiore margine sinuato, postico angustiore rotundato subflexuoso, margine ventrali integro arcuato.*

Hab. in Guadaloupiâ. (Mollusca, Pl. VIII. fig. 7.)

Shell transverse, oval, white, fragile, semipellucid, concentrically lamellose, lamellæ rather elevated and wide apart, interstices very finely longitudinally striated, anterior side wider, the margin sinuated, posterior side narrower, rounded, subflexuous, ventral margin entire and arcuated.

Hab. Guadaloupe; Governor Admiral Tourbeyre. (Mus. Cuming.)

CUMINGIA STRIATA, A. Adams. *C. testā ovato-trigonali subcentricos alba tenui fragili; striis transversis concentricis elevatis confertis, interstitiis longitudinaliter striatis, latere antico latiore rotundato, postico subacuminato, margine ventrali posticè coarctato.*

(Mollusca, Pl. VIII. fig. 5.)

Shell ovately trigonal, somewhat ventricose, white, thin, fragile, with transverse concentric crowded elevated striae, the interstices longitudinally very finely striated, anterior side wider and rounded, posterior side rather acuminated, ventral margin posteriorly contracted.

Hab. Conception; seven fathoms, sandy mud; *H. C.* (Mus. Cuming.)

CUMINGIA SINUOSA, A. Adams. *C. testā subtrigonali albā semipellucidā subaequilaterali concentricè lamellosā, interstitiis longitudinaliter substriatis, latere antico sublatiore rotundato, postico angustiore, margine ventrali posticè valde sinuato.*

Hab. in Indiâ Occidentali. (Mollusca, Pl. VIII. fig. 6.)

Shell subtrigonal, white, semipellucid, subequilateral, concentrically lamellose, interstices longitudinally substriated, anterior side rather wider and rounded, posterior side narrower, ventral margin posteriorly deeply sinuated.

Hab. West Indies. (Mus. Cuming.)

February 12, 1850.

William Yarrell, Esq., Vice-President, in the Chair.

The following papers were read :—

1. ON THE TRICHOGLOSSINE GENUS OF PARROTS, EOS, WITH THE DESCRIPTION OF TWO NEW SPECIES. BY CHARLES LUCIAN, PRINCE BONAPARTE, MEMBER OF THE PRINCIPAL ACADEMIES OF EUROPE AND AMERICA.

The genus *Eos* is, like *Eclectus*, a new instance of the impropriety of that *middling course* (as disgusting in science as it is in politics), of uniting together by two and two, four and four, &c., small groups (or *States*), which, natural by themselves, have no stronger relation to each other than to any other member of their family. Take for example (comparing them to Naples and Sicily!) *Spiza* and *Paroaria*, Bon., united by G. R. Gray under his *Spiza*! amongst the *Fringillidae*, and amongst the Parrots *Psittacodis** and *Eclectus* confounded together by the same process!

The genus *Eos* is intermediate between the two subfamilies *Trichoglossinæ* and *Loriinæ*. Although it may astonish some naturalists that I do not consider it as one of the latter, still, on account of its tail, its anatomy and its habits, I keep it within the boundaries of the former, in close relation with my new genus *Chalcopsitta*†,

* Since I speak of *Psittacodis* (the only green Genus of Lorine Parrots, which forms the same beautiful passage from *Loriinae* to *Psittacinae* that *Eos* does from *Trichoglossinæ* to *Loriinæ*), let me submit to the Society the phrases of two new species that make the whole number hitherto known five: they come as near *Psittacodis magnus* or *sinensis* (with which I for that reason compare them) as the three *Eclecti* do to each other:—

1. *PSITTACUS MAGNUS ET SINENSIS*, Gm. (*viridis*, Lath.; *lateralis*, Shaw; *Mascarinus prasinus*, Less.; *Psittacodis magnus*, Wagl.; *Eclectus! polychloros!* Gr. ex Scopoli) Pl. Enl. 514; Edw. B. t. 231; Lev. Perr. t. 132.

Major: *iliis rubris*: *margine alarum cyaneo*: *cauda apice subconcolori*.

2. *PSITTACODIS INTERMEDIUS*, Bp. Mus. Lugd.

Minor: *iliis rubris*: *margine alarum rubro*: *cauda apice subconcolori*.

3. *PSITTACODIS WESTERMANNI*, Bp. Zool. Soc. Amst.

Minor: *iliis concoloribus*: *margine alarum cæruleo*: *cauda apice subconcolori*. Dedicated to the able and modest Director of the Zoological Society of Amsterdam, where this new Parrot is living.

† This new genus of mine, though composed of decided *Trichoglossine Parrots*, shows a strong affinity, not only to the *Lorine* but also to the *Platycercine*. It is composed in fact of

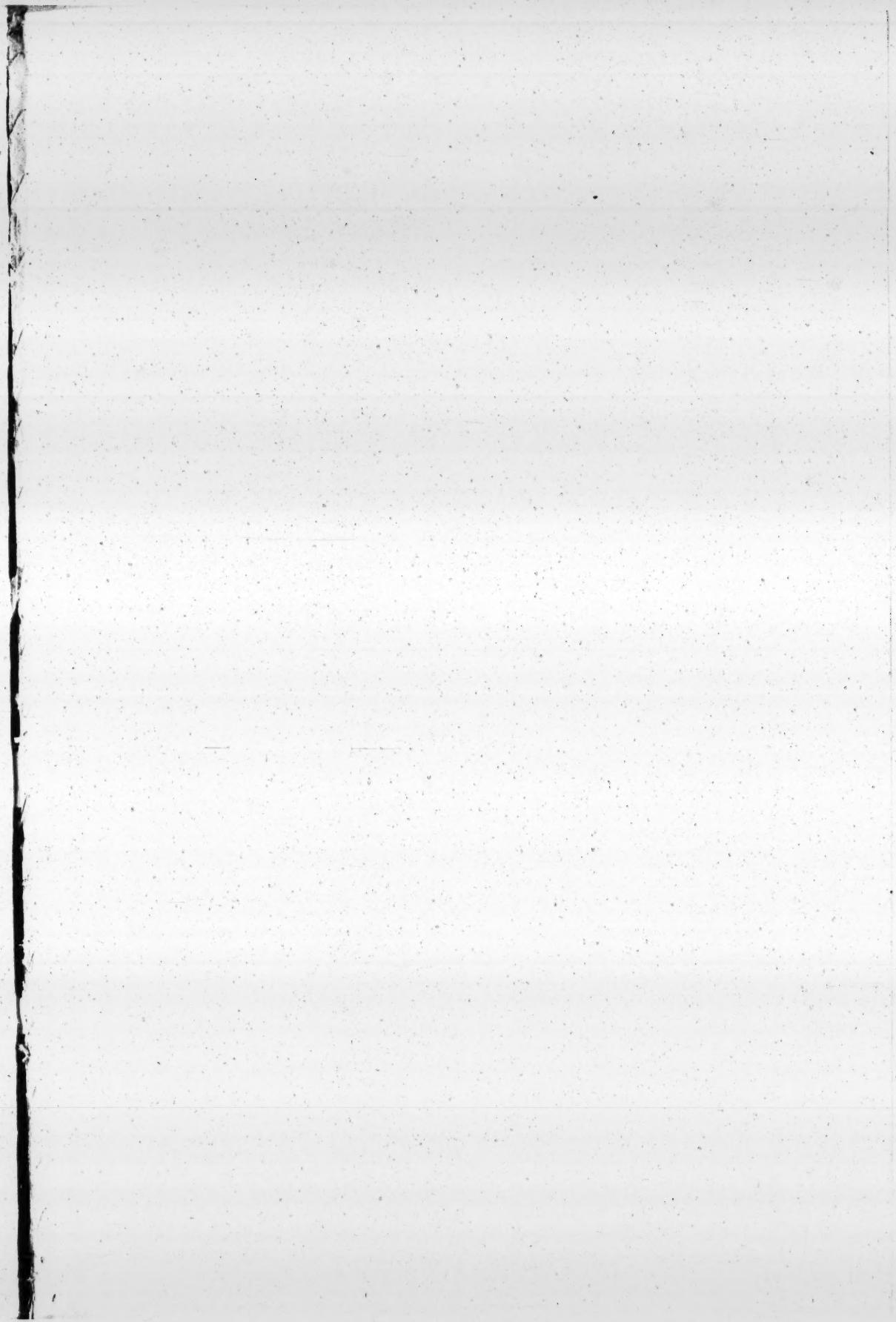
1. *PLATYCERCUS ATER*, Gr. (*Psittacus novæ guineæ*, Gm.; *Ch. novæ guinea*, Bp.); and of

2. *EOS SCINTILLATA*, Gr. (*Psittacus scintillatus*, Temm.; *Ch. scintillans*, Bp.); to which I have added a third new species, also from the Moluccas:—

3. *CHALCOPSITTA RUBIGINOSA*, Bp. Mus. Lugd. ex Ins. Barabay et Guebe. (Aves, Pl. XVI.)

E. purpureo-badia, *capite obscuriore*; *subtus fasciolata*, *plumis singulis lunulâ medianâ et apicali nigricante*: *remigibus rectricibusque rirescentibus caudâ*; *apicem versus gradatim lutescente*.

Rostrum rubrum: *pedes nigri*: *irides albæ*. *Magnitud. Turdi*.





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Wolf 24th

Fregos cyanogenia Bonap.

EGS CYANOCENIA Portap



Nell.

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THE SEMI-LAPWING. Bonap.



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HALOPSITTA SUBIGINOSA Bonap.

which connects it with *Trichoglossus*, the type and centre of the subfamily; as on the other side *Lathamus* and *Charmosina* connect the same *Trichoglossus* through *Coriphilus* (and especially by means of *Lathamus*) with the subfamily *Platycercinæ*.

It may be characterized by its elegant form, small stature, compact, red plumage with more or less blue; compressed, moderate, red bill, with the cere apparent (not concealed as in *Eclectus*); short feet, with robust toes and powerful, arched, very acute nails; and longish, not very broad, wedged tail.

It is composed, to my knowledge, of only seven species;—five already described (and some of them too many times) in the systems, and two new ones, which form the subject of the present paper, and of which I subjoin the faithful portraits drawn by an anonymous hand, which has no merit in keeping the transparent veil upon an additional claim to our admiration and gratitude, since it is so far beneath its others! And when I say that only five are the hitherto known species of *Eos*, it is because I do not count *Eos variegata* and *Eos Isidorii* of Wagler, since, the first is evidently nothing but a *variegated* or *pied bird*, and the other, named, described and figured by Swainson, appears identical with *Eos riciniata*, for which the false name of *cochinchinensis* cannot be retained. Of the other three (out of the ten admitted by our friend G. R. Gray, in his ‘Génera of Birds’), *E. scintillata* is a *Chalcopsitta*, and *E. cervicalis* and *ornata* are *Trichoglossi*!

1. *Eos CYANOPENNA*, Bp. (Aves, Pl. XIV.)

E. rubra; macula magnâ periophthalmicâ cyaneâ: humeris ex toto, remigibus elongatis rectricibusque magnâ ex parte nigris.

Long. 9 poll.; alæ, 6 $\frac{1}{4}$ poll.; caudæ, 4 poll.

Close to *Eos indica* or *coccinea*, but having no blue on the head, back or breast; and instead, a large blue patch, including the eye and covering the cheek, which *Eos indica* has red; the black also is more predominant on the wings, and the red tinge duller. The phrase in English may be:

“ Brownish red; the whole of the shoulder and great part of the wing- and tail-feathers black; a large azure patch on each side of the head.”

I found the specimen upon which I did not hesitate to establish my species among the endless treasures of the Leyden Museum.

2. *Eos SEMILARVATA*, Bp. (Aves, Pl. XV.)

E. coccinea; vittâ a guldâ ultrâ oculos, maculâ utrinque scapulari, crisoque, cyaneis: remigibus brevibus rectricibusque apice tantum nigris.

Long. 9 poll.; alæ, 5 $\frac{3}{4}$ poll.; cauda, 4 poll.

Resembling *Eos rubra*, but much smaller and *half-masked*!

“ Entirely red, even on the shoulders; the tips only of the quills and tail-feathers black; two symmetrical spots on the scapularies, under tail-coverts and *semi-mask* extending from the throat behind the eyes, rich blue.”

I picked up this beautiful species in the rising Museum annexed to the Zoological Gardens of Amsterdam ; and as soon as he became aware of the value of his bird, Mr. Westermann, as a compliment to Dr. Schlegel and myself, with a liberality of which few men even of science are capable, made a present of it to the Leyden Museum ; where, duly greeted by Mr. Temminck, the typical specimen is safely deposited.

To complete the monography of the genus, I add the comparative phrases of the five other species, all of which have several beautiful representatives in the Leyden Museum.

1. **EOS INDICA**, Wagl.

E. coccinea ; fasciā verticis latissimā, cervice, dorso, pectore, tibiisque, cyaneis : tectricibus alarum internis et remigibus apice nigris.

Synonyms.

Psittacus indicus, Gm.

Psittacus variegatus, Gm., Lath. ex Buff. Pl. Enl. 143.

Psittacus coccineus, Lath.

Eos indica, Gr.

Eos variegata, Gr.

Perruche des Indes orientales, Buff. Pl. Enl. 143, accidental var. !

Le Lori-Perruche violet et rouge, Levaill. Perr. t. 53.

Hab. In Insulis Moluccis.

2. **EOS RUBRA**, Wagl.

E. rubra ; criso, scapularibusque cyaneis ; tectorum majorum margine apicali, remigibusque primariis externè nigris.

Synonyms.

Psittacus ruber, Gm.

Psittacus borneus? Gm., Lath. jun.

Psittacus cæruleatus, Shaw.

Psittacus cyanotus, Vieill.

Eos rubra, Gr.

Lory de la Chine, Buff. Pl. Enl. 519.

Le Perroquet Lori à franges bleues, Levaill. Perr. t. 93.

La Perruche écarlate, Lev. Perr. t. 44.

Hab. In Insulis Moluccis ; Amboina.

3. **EOS GUEBIENSIS**, Wagl.

E. coccinea, saepius tamquam squamata ; plumis pilei, colli, pectoris et laterum margine nigro-virescentibus : alarum fasciā duplīci remigibusque apice nigris.

Synonyms.

Psittacus guebiensis, Auct.

Psittacus squameus, Shaw.

Eos squamata, Gr. ex Scopoli.

Lory de Gueby, Buff. Pl. Enl. 684.

Le Lori écaillé, Levaill. Perr. t. 51.

Hab. In Insulis Gueby, Buron et Ceram.

4. EOS RICINIATA, Bp.

E. rubra; vertice, collo et maculâ abdominali magnâ, cyaneis: tectricibus alarum remigibusque ad apicem latè nigris.

Synonyms.

Psittacus cochinchinensis, Lath.

Psittacus riciniatus, Bechst.

Psittacus eucullatus, Shaw.

Lorius Isidorii, Sw. Zool. Ill. n. s. t.

Lorius riciniatus, Müll.

Eos cochinchinensis, Wagl., Gr.

Perruche à chaperon bleu, Levaill. Perr. t. 54.

Hab. In Insulis Moluccis. Gilolo et Ternate, Forsten, Müller; nec in Cochinchina!

5. EOS CYANOSTRIATA, Gr.

E. rubra, alis caudâque, nigro variis; maculâ postoculari nigro-cæruleâ: dorso striis cæruleis.

Synonyms.

Lorius borneus! Less. Traité d'Orn. p. 192, nec Lath.

Eos cyanostriata, Gray and Mitchell, Gen. of Birds, t. 103.

Hab. In Insulis Moluccis, minimè in Borneo!

2. AN ARRANGEMENT OF STOMATELLIDÆ, INCLUDING THE CHARACTERS OF A NEW GENUS, AND OF SEVERAL NEW SPECIES.
BY ARTHUR ADAMS, R.N., F.L.S. ETC.

STOMATELLIDÆ.

Head broad, proboscisidiform; tentacles subulate, with a fimbriated lobe at their inner bases; eyes on peduncles at their outer bases; mantle with the front edge entire; muscle of attachment crescentic, open in front; foot with a thin membrane. Operculum rudimentary or none. Shell imbricate, with a crescentic muscular impression, open in front.

The family *Stomatellidæ* differs from that of *Haliotidæ* in the mantle not being fissured anteriorly, in the muscle of attachment being in the form of a horseshoe round the sides and posterior part of the mantle, instead of being oval and central, and in the shell not being perforated. In their habits they are littoral, living on coral reefs and attached to stones near the shore. Some of the genera, as *Gena*, *Stomatella* and *Stomatia*, have considerable locomotive powers, and glide, especially *Gena*, with some degree of celerity. The latter genus and *Stomatia* possess the faculty, common to some other kinds of mollusca, of spontaneously detaching a considerable portion of the hind part of the foot when disturbed or irritated.

STOMATELLA, Lamarck.

Animal spiral, retractile within the shell; tentacular lobes triangular, with the front edge fringed; foot small, not tubercular, not

produced posteriorly, opereuligerous, lateral membrane very wide, the circumference regularly fimbriated. Operculum orbicular, thin, horny, multispiral. Shell spiral, suborbicular, depressed, transversely ribbed or sulciferous; spire more or less elevated, whorls rounded; aperture large, wider than long, pearly within.

STOMATELLA IMBRICATA, Lamarck.

Hab. Torres Straits; *Jukes.* (Mus. Cuming.)

Stomatella imbricata, Lamk. Ency. Méth. p. 450. f. 2; *Hist. Nat. An. s. Vert.* vol. vi. p. 209.

STOMATELLA CANCELLOATA, Krauss.

Hab. Table Bay, Cape of Good Hope. (Mus. Cuming.)

Stomatella cancellata, Krauss, Sudafican Moll. tab. 5. fig. 26.

STOMATELLA COSTELLATA, Adams. *S. testa suborbiculata, convexo-depressa, albida, imperforata, costulis transversis obtusis striisque elevatis longitudinalibus decussatis; spiræ subprominula; aperturæ magnæ, obliquæ, oblongæ.*

Hab. —?

Shell suborbicular, convexly depressed, whitish, imperforate, with obtuse transverse ribs and decussating longitudinal elevated striae; spire rather prominent; aperture large, oblique, oblong.

Hab. —? (Mus. Metcalf.)

STOMATELLA ARTICULATA, Adams. *S. testa suborbiculari, imperforata, convexa, tenui, grisea, costulis transversis nigro-articulatis, interstitiis lineis longitudinalibus elevatis ornata; spiræ prominula, anfractibus rotundatis; aperturæ oblongo-ovali, longiore quam latiore.*

Hab. In insulis Pacificis.

Shell suborbicular, imperforate, convex, thin, grey, ornamented with transverse ribs articulated with black, the interstices with longitudinal elevated lines; spire rather prominent, whorls rounded; aperture oblong-oval.

Hab. Australia; Lord Hood's Island, South Seas, on the pearl oyster; *H. C.* (Mus. Cuming.)

STOMATELLA SULCIFERA, Lamarck.

Hab. Philippines, Catbalonga; island of Samar, under stones; isle of Ticao, on the reefs, low water; *H. C.* (Mus. Cuming.)

Stomatella sulcifera, Lamk. Hist. Nat. An. s. Vert. p. 210.

STOMATELLA MACULATA, Quoy and Gaimard.

Hab. Catanuan, province of Tayabas, island of Luzon, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATELLA MONILIFERA, Adams. *S. testa suborbiculari, convexo-depressa, imperforata, albida, rufo-punctata, costulis moniliferis confertis transversis ornata; aperturæ obliquæ, subcirculari.*

Hab. —?

Shell suborbicular, convexly depressed, imperforate, whitish, with rufous spots, ornamented with small, close-set, beaded, transverse ribs; aperture oblique, subcircular.

Hab. —? (Mus. Metcalf.)

STOMATELLA DECOLORATA, Gould.

Hab. Mangsi Island; *Gould.*

Species unknown to me. "Allied to *S. maculata*, Quoy, but the spire is less elevated, aperture more round, and a plain white lunate area adjacent to the columella."

Stomatella decolorata, Gould, Expedition, Shells, p. 51.

STOMATELLA PAPYRACEA, Chemnitz.

Hab. China Sea and Sooloo Archipelago. (Mus. Cuming.)

Turbo papyraceus, Chemnitz. *Stomatella tumida, Gould, Expedition, Shells*, p. 51.

STOMATELLA MALUKANA, Adams. *S. testa suborbiculata, convexa, imperforata, transversim sulcatá, longitudinaliter striatá, costulis transversis striatis cincta, mustelina rufo-fusco variegata, subtus costis albo rufoque articulatis; spirá prominula; aperturá ovali, longiore quam latiore.*

Hab. in insulis Moluccis.

Shell suborbicular, convex, imperforate, transversely sulcated, longitudinally striated, encircled with transversely striated ribs, yellowish brown variegated with red brown, inferiorly the ribs articulated with white and fuscous; spire rather prominent; aperture oval, longer than wide.

Hab. Molluccas.

STOMATELLA ORBICULATA, Adams. *S. testa suborbiculari, convexa, virescenti, castaneo variegata, transversim sulcatá, longitudinaliter striatá, costis confertis rotundatis; spirá prominula, anfractibus rotundatis; aperturá subcirculari, intus viridescenti.*

Hab. in freto Mosambico.

Shell suborbicular, convex, greenish, variegated with chestnut, transversely sulcated, longitudinally striated, with numerous round, close-set, transverse ribs; spire prominent, whorls rounded; aperture nearly circular, pearly and green internally.

Hab. Mosambique, under stones, low water; *Rev. W. V. Henner.* (Mus. Cuming.)

STOMATELLA JAPONICA, Adams. *S. testa suborbiculari, imperforata, convexa, fuscata, transversim costulata, costulis confertis nodulosis, interstitiis tenuissime longitudinaliter striatis; spirá prominula, anfractibus costatis rotundatis; aperturá subcirculari, intus margaritacea.*

Hab. in insulis Japonicis.

Shell suborbicular, imperforate, convex, fuscous, transversely ribbed; ribs small, nodulous, close together; interstices with smaller

ribs, and very finely longitudinally striated; spire somewhat prominent; whorls ribbed and rounded; aperture subcircular, pearly and green within.

Hab. Japan. (Mus. Cuming.)

STOMATELLA HALIOTIDEA, Sowerby.

Hab. Philippines, Oalaguete; Loon, isle of Bohol, under stones, low water; San Estevan, prov. South Ilocos; *H. C.* (Mus. Cuming.) *Stomatella haliotidea*, *Sowerby*, *Genera*.

STOMATELLA FULGURANS, Adams. *S. testa suborbiculari, subperforata, convexa; spirae acuminata, apice acuto rosea, transversim sulcata, carinulis transversis albo maculatis, longitudinaliter striatis, striis subtus obsoletis, albida lineis fuscis undulatis variegata; apertura ovali, obliqua, intus margaritacea, valde sulcosa.*

Hab. in insulis Philippinis.

Shell suborbicular, subperforate, convex; spire acuminated, apex acute, rosy, transversely sulcated, with small transverse keels marked with white, longitudinally striated, striæ obsolete inferiorly, whitish variegated with brown undulating lines; aperture oval, oblique, pearly within and strongly sulcated.

Hab. Bais, island of Negros, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATELLA SANGUINEA, Adams. *S. testa orbiculata, depressa; spirae prominula, acuta, coccinea, transversim tenuissime sulcata, longitudinaliter obliquè striata, carinulis transversis subdistantibus nodulosis; apertura ovali, obliqua; columella subcallosa, area umbilicali albâ, intus margaritacea sulcosa.*

Hab. in insulis Philippinis.

Shell orbicular, depressed; spire rather prominent, acute, blood-red, transversely very finely sulcated, longitudinally obliquely striated, with nodulous, transverse, rather distant carinæ; aperture oval, oblique; columella somewhat callous, with a white umbilical area, pearly and sulcated internally.

Hab. Island of Ticao, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATELLA SPECIOSA, Adams. *S. testa orbiculato-conica, albâ sanguineo maculata, transversim carinata, longitudinaliter valde striata, carinis obtusis prominentibus carinulis intermediis; spirae prominula, anfractibus tricarinatis; apertura ovali, intus margaritacea.*

Hab. ad insulam Grimwoodianam.

Shell orbicularly conical, white marked with crimson blotches, transversely carinated, longitudinally strongly striated, keels obtuse, rather prominent, with small intermediate keels; spire rather prominent, whorls tricarinated; aperture oval, pearly within.

Hab. Grimwood's Island; *H. C.* (Mus. Cuming.)

STOMATELLA COCCINEA, Adams. *S. testá orbiculato-conicá, subperforatá, coccineá, maculis albis seriátim dispositis in anfractu ultimo ornatá, transversim tenuiter sulcatá, anfractu ultimo subangulato; spírā prominente, anfractibus bicarinatis; aperturá subcirculari, labio posticè reflexo, calloso.*

Hab. in insulis Occidentalibus.

Shell orbicularly conic, subperforate, scarlet, adorned with white spots arranged in a row on the last whorl, transversely very finely sullated, last whorl somewhat angulated; spire prominent, whorls bicarinated; aperture subcircular, inner lip posteriorly reflexed and callous.

Hab. St. John's; Mr. Hartweg.

STOMATELLA TIGRINA, Adams. *S. testá orbiculato-conicá, perforatá, albidd, fasciis rufis radiatim dispositis ornatá, bicarinatá, carinis elevatusculis, obtusis, transversim striatd, striis regularibus; spírā prominente, anfractibus angulatis; aperturá subcirculari, labio subreflexo, culloso; umbilico distincto, subobtecto.*

Hab. —?

Shell orbicularly conical, umbilicated, whitish adorned with red bands radiately disposed, bicarinated, keels rather elevated, obtuse, transversely striated, striæ regular; spire prominent, whorls angulated; aperture subcircular, inner lip somewhat reflexed and callous; umbilicus distinct, partly covered.

Hab. —?

STOMATELLA MARGARITANA, Adams. *S. testá turbinatá, spirā elevatá, anfractibus rotundatis, rubrá longitudinaliter substriatá, transversim costulatá, costulis subnodososis inaequalibus; aperturá suborbiculari, intus margaritacea, labro semicirculari; umbilico callo, obtecto.*

Hab. in littoribus Australiæ. (Mus. Cuming.)

A small, red, transversely ribbed species, having very much the appearance of a *Margarita*.

STOMATELLA BIPORCATA, Adams. *S. testá turbinatá, subdepressá, rubrá, albo obscurè variegatá, transversim sulcatá; spirā acuminatá, anfractibus quatuor, anfractu ultimo porcis duabus prominentibus instructa; aperturá subquadrata, intus margaritacea, labio subrecto, labro in medio biangulato, umbilico callo, obtecto.*

Hab. in littoribus Australiæ. (Mus. Cuming.)

A small red species with two rounded ridges on the last whorl and a subquadrate aperture.

STOMATIA, Helbling.

Animal spiral, too large to entirely enter the shell, tentacular lobes digitated. Foot large, tubercular, greatly produced behind; lateral membrane fringed, ending anteriorly on the left side in a fimbriated

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crest under the eye-peduncle, and on the right in a slightly projecting fold or gutter leading to the respiratory cavity. Operculum none. Shell subspiral, oblong, or suborbicular, carinated or tuberculated; spire prominent; aperture wider than long, pearlaceous within.

STOMATIA PHYMATIS, Lamarck.

Hab. Philippine Islands, Matnag, province of Albay, Luzon, on the reefs; *H. C.* (Mus. Cuming.)

STOMATIA AUSTRALIS, Adams. *S. testā haliotidea, ovato-oblongā, sublatā, olivacea, dorso lavigatā, transversim tenuē striatā, carinis duabus rotundatis, inferiori tuberculatā; aperturā antīcē dilatatā, labro supra ultimum anfractum ascende.*

Hab. in littoribus Australiae.

Shell rather broad, olivaceous, back nearly plain, transversely finely striated, with two rounded keels, the lower one tuberculated; aperture dilated anteriorly, outer lip ascending on the body whorl.

Hab. Darnley's Island, Torres Straits, under stones; *Jukes.* (Mus. Cuming.)

STOMATIA DUPLICATA, Sowerby.

(P. Z. S. Mollusca, Pl. VIII. fig. 13, 14, 15.)

Hab. Cagayan, province of Misamis, island of Mindanao, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATIA ANGULATA, Adams. *S. testā orbiculato-convexā, subdepressā, viridulā, transversim valdē costulatā, intersticiis longitudinaliter striatis, carinis duabus elevatis simplicibus angulatis; aperturā transversā, subcirculari, labro in medio biangulato.*

Hab. in insulis Philippinis.

Shell orbicular, rather depressed, olive-green, transversely coarsely costulated, interstices longitudinally striated, with two elevated, simple, angulated ridges; aperture transverse, suborbicular, outer lip biangulated in the middle.

Hab. San Estevan, province of South Ilocos, island of Luzon and island of Ticao, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATIA DECUSSATA, Adams. *S. testā ovato-oblongā, longitudinaliter et transversim decussatē striatā, carinis duabus simplicibus aut subtuberculatis angulatis prominentibus, pallida maculis fuscis variegatā; spirā elevatā; aperturā obliquā, ferè orbiculari, labro biangulato in medio.*

Hab. in insulis Philippinis.

Shell decussately transversely and longitudinally striated with two acute simple or subtuberculated prominent keels, pale marked with light brown blotches and fine puncta; spire elevated; aperture oblique, nearly orbicular, outer lip biangulated in the middle.

Hab. Sorsogon, province of Albay, island of Luzon, on smooth stones, 6 fathoms; *H. C.* (Mus. Cuming.)

STOMATIA ACUMINATA, Adams. *S. testá haliotidéa, suborbiculatá, subfuscá, cancellatá, transversim costatá, costis tribus prominentibus, medió valdè prominulá tuberculatá, valdè plicatá prope suturam, longitudinaliter elevatè striatá; spirá prominulá, acuminatá, anfractibus quatuor angulatis, labro in medio triangulato.*

Hab. in insulis Philippinis.

Shell reddish brown, cancellated, transversely ribbed, three ribs very prominent, the middle one more so than the others and strongly tuberculated, strongly plicated near the suture, longitudinally elevately striated; spire prominent, acuminated, whorls four, angled; aperture suborbicular, obliquely transverse, outer lip triangulated in the middle.

Hab. Philippine Islands. (Mus. Cuming.)

STOMATIA LIRATA, Adams. *S. testá orbiculato-concrex, liris transversis subæqualibus elevatis vix nodulosis, interstitiis valdè longitudinaliter striatis, prope suturam subplicatá, pallidá, fusco radiatim marmoratá; spirá subprominulá, anfractibus rotundatis; aperturá obliqua, oblongo-ovali, labro convexo, rotundato.*

Hab. —?

Shell orbicular, convex, with nearly equal transverse raised ridges, ridges slightly nodulous, interstices strongly longitudinally striated, plicated near the spire, pallid, radiately marbled with brown; spire rather elevated, whorls rounded; aperture oblique, oblong-oval, outer lip convex, rounded.

Hab. —? (Mus. Cuming.)

STOMATIA RUBRA, Lamarck.

Hab. Philippine and Corean Archipelago. (Mus. Cuming.)

STOMATIA NOTATA, Adams. *S. testá suborbiculari, depresso, pallide roséa, maculis purpureis valdè distinctis ornata, transversim carinata, carinis acutis prominentibus subdistantioribus, longitudinaliter valdè obliquè striata; spirá subprominulá, anfractibus carinatis, apice acuto; aperturá subcirculari, intus margaritacea et transversim sulcatá.*

Hab. —? (Mollusca, Pl. VIII. fig. 16.)

Shell suborbicular, depressed, pale rose-colour, adorned with very defined dark purple spots, transversely keeled; keels acute, rather prominent, somewhat wide apart, longitudinally strongly obliquely striated; spire rather prominent, whorls carinated, apex acute; aperture subcircular, transversely sulcated and pearly within.

Hab. —? (Mus. Cuming.)

STOMATIA CANDIDA, Adams. *S. testá suborbiculata, depresso, candida, transversim tota carinata, carinulis parvis confertis permultis elevatisculis subnodulosis, interstitiis longitudinaliter tenuissimè striata; spirá depressiuscula, anfractibus rotundatis; aperturá obliqua, subcirculari, longiore quam latiore.*

Hab. in insulis Koreanicis.

Shell orbicular, depressed, white, transversely entirely carinated; keels very small, close together and very numerous, subnodulous and slightly elevated; interstices longitudinally very finely striated; spire somewhat depressed, whorls rounded; aperture oblique, subcircular, longer than wide.

Hab. Korean Archipelago, coral reefs; *A. H.* (Mus. Cuming.)

STOMATIA PALLIDA, Adams. *S. testa suborbiculari; spiræ acuminatæ, albd, radiis pallidis longitudinalibus pictæ, transversim liratæ, interstitiis decussatè striatis; aperturæ transversæ, subovali, intus porcellana, labio subrecto, calloso.*

Hab. ad Insulam Lord Hood, dedicav. (Mus. Cuming.)

A species somewhat resembling in colouring the striped variety of *S. notata*, but which differs materially in form and sculpture.

MICROTIS, new genus.

Animal as in *Stomatia*, but the foot with a deep anterior fissure for the head, and the front edge bilobed. Operculum none. Shell spiral, suborbicular, depressed, with two tuberculated ridges; spire slightly prominent; aperture very large, wider than long, pearly within, columellar margin spiral, visible as far as the apex of the spire.

MICROTIS TUBERCULATA, Adams. *M. testa suborbiculari, haliotidæ, valde depressâ, viride variegatâ, transversim striatâ, bicarinatâ, carinis tuberculatis, prope suturam nodulosim plicatâ; spiræ vix elevatæ, anfractibus carinatis; aperturâ magnâ, ovali, intus bisulcatâ margaritacea.*

Hab. in insulis Philippinis. (Mollusca, Pl. VIII. fig. 8-12.)

Shell suborbicular, ear-shaped, greatly depressed, variegated with green, transversely striated, bicarinated; keels tuberculated, nodosely plicated near the suture; spire scarcely elevated, whorls carinated; aperture large, oval, pearly within, with two concentric parallel grooves.

Hab. Island of Capul, on the sands, high water; *H. C.* (Mus. Cuming.)

GENA, Gray.

Animal subspiral, oval, depressed, too large to enter the shell; tentacular lobes plumose. Foot very large, tubercular, posteriorly produced; lateral membrane not fimbriated, more or less extended, and covering the shell. Operculum none. Shell subspiral, oblong, ear-shaped, depressed, smooth or striated; spire flattened, nearly obsolete; aperture large, pearly within.

GENA PLANULATA, Lamarck.

Hab. Isle of Camaguin, under smooth stones, low water; Gindulman, isle of Bohol, under stones; *H. C.* (Mus. Cuming.)

Stomatella planulata, Lamarck, Hist. An. s. Vert. vol. vi. p. 210; Encyclop. Méth. pl. 40. f. 4 a, b.

GENA AURICULA, Lamarck.

Hab. Eastern Seas; Red Sea; Celebes. (Mus. Cuming.)
Stomatella auricula, Lamk. *Hist. An. s. Vert. vi.* p. 210. *Patella lutea*, Linn.

GENA NIGRA, Quoy and Gaimard.

Hab. Eastern Seas. (Mus. Cuming.)
Stomatella nigra, Quoy & Gaimard, *Voy. de l'Astr. v. 3. pl. 66 bis*, fig. 10-12.

GENA PLUMBEA, Adams. *G. testa haliotidea, ovato-oblonga, dorso latere dextro gibbosum, sinistro planulatum, plumbeum, decussatè tota striatum; spiræ prominulæ, anfractibus rotundatis, anfractu ultimo ad suturam gibbosum; aperturæ posticæ subcanciliculatae, labro in medio flexuoso.*

Hab. Java.

Shell gibbous on the right side, flattened on the left, lead-coloured, decussately striated over the back; spire rather prominent, the whorls rounded, last whorl gibbous at the suture; aperture slightly channeled posteriorly, outer lip flexuous in the middle.

Hab. Java. (Mus. Cuming.)

GENA STRIGOSA, Adams. *G. testa haliotidea, ovato-oblonga, dorso subplanata, tota striata, striis irregularibus subconfertis, olivaceo lilaceo alboque varia, fasciis subfuscis, pallidis alternantibus longitudinaliter ornata, labro haud sinuoso.*

Hab. —?

Shell rather depressed, the back equally convex, striated all over, olivaceous varied with white and lilac, marked with alternate light and dark bands, the light bands sometimes articulated; spire depressed, outer lip slightly sinuous.

Hab. —? (Mus. Cuming.)

GENA STRIATULA, Adams. *G. testa haliotidea, ovato-oblonga, dorso planiuscula, tota striata, striis profundis subdistantibus, rubra, flaveolo aurantiaco fusoque varie picta; spiræ prominulæ, nunquam subdistorta; labro valde flexuoso.*

Hab. Australia; et in insulis Philippinis.

Shell very elongated, slightly convex, strongly striated all over the back, red varied with orange, light yellow and brown; spire elevated, often distorted; outer lip very flexuous.

Hab. Calapan, island of Mindoro, on small stones, 9 fathoms; H. C. Swan River, Lieut. Preston; Australia. (Mus. Cuming.)

GENA VARIA, Adams. *G. testa haliotidea, ovato-oblonga, polita, dorso æqualiter convexa, latere sinistro striata; luteo, rubro alboque variegata; spiræ prominulæ, erecta, acuminata.*

Hab. Australia; et in insulis Philippinis.

Shell smooth, polished, back equally rounded, striated on the left side, varied with yellow, red and white; spire rather elevated, lateral, upright and pointed.

Hab. Calapan, island of Mindoro, on small stones, 9 fathoms; H. C.

Acapulco, on the sands, Col. Moffat; Australia. A pretty little species usually confounded with *G. auricula*. (Mus. Cuming.)

GENA CONCINNA, Gould.

Hab. Sandy Island.

GENA MINIMA, Dufo.

Hab. Seychelles, dredged from 6 fathoms; *Dufo*.

Stomatella minima, *Dufo*, *Ann. Sc. Nat.* Oct. 1840, p. 202. Species unknown to me.

GENA IRASATA, Dufo.

Hab. Seychelles.

Stomatella irasata, *Dufo*, *Ann. Sc. Nat.* Oct. 1840. Species unknown to me.

GENA PULCHELLA, Adams. *G. testa convexo-depressa, ovali, albâ, rufo maculata, dorso convexâ, totâ striata; spirâ prominula, unfractibus rotundatis; aperturâ magna, ovali, intus margaritacea, iridescente.*

Hab. —?

Shell convexly depressed, oval, white, with large rufous spots; back convex, striated all over; spire rather prominent, whorls rounded; aperture large, oval, pearly within.

Hab. —? (Mus. Metcalf.)

GENA LINTRICULA, Adams. *G. testa haliotidea, oblonga, dorso convexa, tota tenuissimè striata, tenui, fragili, carneola, rubro maculata; spirâ subterminali, minimâ, ad latus decumbente; aperturâ aperta, valde elongata.*

Hab. in insulis Philippinis.

Shell elongated, regularly convex, entirely striated, thin, fragile, pink, with darker spotted and articulated lines; spire nearly posterior, slightly elevated; aperture elongated anteriorly, dilated.

Hab. Calapan, island of Mindoro, on smooth stones, 9 fathoms; *H. C.* (Mus. Cuming.)

GENA ASPERULATA, Adams. *G. testa haliotidea, dorso convexa, rufo-fusca cingulâ albâ latâ longitudinali ornatâ, lineis elevatis subconfertis, striisque longitudinalibus obliquis decussatâ; spirâ posticâ, subprominula, albâ; aperturâ elongata, ovali.*

Hab. —?

Shell ear-shaped, back convex, red-brown with a broad white longitudinal band, decussated with transverse raised lines and oblique longitudinal elevated striae; spire posterior, slightly prominent; aperture elongated, oval.

Hab. —? (Mus. Metcalf.)

GENA NEBULOSA, Adams. *G. testa haliotidea, ovato-oblonga, dorso totâ striata, alba rufo-fusco nebulosa; spirâ prominula, unfractibus angulatis; aperturâ elongata, ovali; columellâ callo crasso rimam umbilicalem obtegente.*

Hab. Australia.

Shell flat, depressed, entirely striated, white clouded with red-brown; spire rather prominent, the whorls angulated; aperture elongated, oval; columella with a thickened callus covering the umbilical fissure.

Hab. Australia. (Mus. Cuming.)

GENA ORNATA, Adams. *G. testā subturbinacē, orati, lævi, politā, dorso convexā, fusco-rubrā, lineis nigris albo-articulatis longitudinalibus; spirā prominulā, roseā; aperturā ovali; columellā curvata, simplici; labro reflexo, posticē subflexuoso.*

Hab. in insulis Philippinis. (Mollusca, Pl. VIII. fig. 17.)

Shell oval, smooth, polished, convex, red-brown, with regular distinct black longitudinal lines articulated with white; spire rosy, rather prominent; aperture oval; columella curved, simple; outer lip convex, slightly inflexed posteriorly.

Hab. Island of Ticao, Philippines, on the reefs, low water; H. C. (Mus. Cuming.)

GENA LINEATA, Adams. *G. testā subturbinacē, solidā, lævi, politā, convexā, ovali, carneolā lineis rubris longitudinalibus ornatā; spirā prominulā, anfractibus rotundatis; aperturā subrotundatā; columellā planulatā, callosā, labro simplice.*

Hab. —?

Shell thick, smooth, polished, convex, oval, light pink, with regular parallel continuous red lines arranged longitudinally; spire prominent, whorls rounded; aperture nearly circular; columella flattened, with a callous deposit, outer lip simple.

Hab. —? (Mus. Cuming.)

BRODERIPIA, Gray.

Animal unknown. Operculum? Shell aencyliform, nonspiral, oblong-ovate, flattened, apex posterior, involute; aperture very large, ovate, pearlaceous internally.

Scutella, Broderip (pars).

BRODERIPIA IRIDESCENTS, Broderip, sp.

Hab. Pacific Ocean, Grimwood's Island. (Mus. Cuming.)

Scutella iridescent, Broderip, Proc. Zool. Soc. June 1834.

BRODERIPIA ROSEA, Broderip, sp.

Hab. Pacific Ocean, Grimwood's Island. (Mus. Cuming.)

Scutella rosea, Broderip, Proc. Zool. Soc. June 1834.

BRODERIPIA CUMINGII, A. Adams. *B. testā oratā, depresso-convexā, subpelluciddā, pallidā, radiis rubris pictā, concentricè corrugato-striatā, striis granulosis, vertice postico excentrico-submarginali; aperturā patulā, intus margaritacea, margine albo limbo maculis rufis picto; margine columellari acutè angulato prominente, posticē subrecto.*

Hab. in insulis Philippinis (Capul). (Mus. Cuming.)

Distinguished from *B. iridescent* by its prominent angulated columellar margin and granulato-corrugose surface.

SCISSURELLA, D'Orbigny.

Animal unknown. Operculum none. Shell very small or minute heliciform; spire depressed; aperture suborbicular, effuse; outer lip with a narrow fissure or slit; umbilicus open.

? *Anatomus, Montfort.*

SCISSURELLA ANGULATA, Lovén.

Hab. Scandinavia.

Scissurella angulata, Lovén, Index Moll. Scand. p. 20.

SCISSURELLA PLICATA, Philippi.

Hab. Shores of the Peninsula of Thapsi.

Scissurella plicata, Phil. En. Moll. Sicil. vol. i. p. 187, vol. ii. tab. 25. fig. 18.

Scissurella d'Orbignyi, Scacchi.

SCISSURELLA STRIATULA, Philippi.

Hab. Peninsula of Magnisi.

Scissurella striatula, Phil. En. Moll. Sicil. vol. ii. p. 160.

SCISSURELLA DECUSSATA, D'Orbigny.

Scissurella decussata, D'Orbigny, Mém. Soc. d'Hist. Nat. de Par. i. p. 340.

SCISSURELLA CRISPATA, Fleming.

Scissurella crispata, Fleming, Brit. An. p. 361-366.

3. MONOGRAPH OF THE GENUS ANATINELLA.

BY ARTHUR ADAMS, R.N., F.L.S. ETC.

ANATINELLA, Sowerby.

Testa ovata æquivalvis, subæquilateralis, latere antico rotundato, postico subrostrato, subtruncato; ligamento interno, processui cochleariformi affixo, dentibus duobus cardinalibus in utrâque valvâ ante processum positis; impressionibus muscularibus duabus, anticâ oblongâ, irregulari, posticâ subcirculari; impressione musculari pallii integrâ; appendice cardinali internâ nulla.

Shell ovate equivalve, nearly equilateral, anterior side rounded, posterior slightly beaked and subtruncated. Ligament internal, fixed to a spoonshaped process in each valve, on the anterior side of which are placed two rather elongated cardinal teeth. Muscular impressions two, lateral, distant, the anterior oblong and irregular, the posterior nearly circular. Palpal impression entire, without any sinus. No testaceous appendage within the hinge.

ANATINELLA SIBBALDII, Sowerby. *A. testâ solidiori, subopacâ, lâvi, valdè concentricâ corrugata, longitudinaliter obsoletè substriatâ; latere postico, acuminato, subtruncato; margine dorsali posticâ decliri; processu cochleariformi crasso lato; margine ventrali valdè arcuato.*

Hab. — ?

Shell rather solid, subopake, smooth, strongly concentrically wrinkled, longitudinally obsoletely substriated; posterior side acuminated, subtruncated; dorsal margin posteriorly sloping; spoon-shaped process thick and wide; ventral margin strongly arcuated.

Hab. Ceylon, on the sands. (Mus. Cuming.)

ANATINELLA DILATATA, Adams. *A. testā tenui, fragili, concentricè corrugatā, longitudinaliter striatā, latere postico dilatato, obliquè valdè truncato, margine dorsali posticè horizontali recto, processu cochleariformi parvo tenui, dentibus cardinalibus valdè divergentibus; margine ventrali arcuato.*

Hab. — ?

Shell thin, fragile, concentrically wrinkled, longitudinally striated; posterior side dilated, obliquely strongly truncated; dorsal margin posteriorly horizontal and straight; spoonshaped process small, thin; cardinal teeth greatly diverging, ventral margin arcuated.

Hab. Puteao, Philippines, on sand-banks, at low water; *H. C.* (Mus. Cuming.)

ANATINELLA VENTRICOSA, Adams. *A. testā tenui, ventricosā, semipellucidd, concentricè corrugatā, longitudinaliter conspicuè striatā, striis elevatisculis, latere postico rotundato; margine dorsali posticè declivi; processu cochleariformi tenui, angusto; margine ventrali leviter arcuato.*

Hab. — ?

Shell thin, ventricose, semipellucid, concentrically wrinkled, longitudinally conspicuously striated, striae rather elevated, posterior side rounded, dorsal margin posteriorly sloping; spoonshaped process thin, narrow, ventral margin slightly arcuated.

Hab. Puteao, Philippines, on sand-banks, at low water; *H. C.* (Mus. Cuming.)

February 26, 1850.

W. Spence, Esq., F.R.S., in the Chair.

The following paper was read :—

1. MONOGRAPHS OF CYCLOSTREMA, MARRYAT, AND SEPARATISTA, GRAY; TWO GENERA OF GASTEROPODOUS MOLLUSKS. BY ARTHUR ADAMS, R.N., F.L.S. ETC.

CYCLOSTREMA, Marryat.

Animal ignotum. Operculum — ? Testa depresso-umbilicata; apertura circularis.

Shell depressed; aperture circular; umbilicus very large, with the volutions of the whorls visible within it.

CYCLOSTREMA CANCELLOATA, Marryat. *C. testā albd, lineis longitudinalibus et transversis elevatis decussantibus inde cancel-*

latā; aperturā labiis cancellatis; cancellis transversim striatis.

Hab. in insulis Philippinis.

Shell white, cancellated, with elevated, decussating transverse and longitudinal lines ; aperture with the lips cancellated ; cancelli transversely striated.

Hab. Baszay, island of Samar, 6 fathoms, coral sand ; *H. C.* (Mus. Cuming.)

Cyclostrema cancellata, Marryat, Trans. Linn. Soc. 1818, vol. xii. p. 338.

CYCLOSTREMA NIVEA, Chemnitz. *C. testā orbiculari, nivē, pelucidd; spirā depresso, anfractibus transversim costellatis, costellis regularibus, superis distantioribus; interstitiū leviter concavis; suturis profundis subcanaliculatis; labro simplici; umbilico peramplo.*

Hab. in maribus Occidentalibus.

Shell orbicular, snowy white, transparent ; spire depressed, whorls transversely ribbed, ribs regular, the upper fewer and wider apart ; interstices slightly concave ; sutures deep, slightly ehamneled ; lip simple ; umbilicus very large.

Hab. Seas of India. (Mus. Cuming.)

Turbo niveus, Chemnitz, Conch. Cab. vol. x. pl. 165. f. 1587 and 1588. Delphinula nivea, Reeve. Delphinula lēvis, Kiener.

CYCLOSTREMA REEVIANA, Hinds. *C. testā orbiculari, subdiscoidē, muticā; spirā depresso-angustula, anfractibus convexis, longitudinaliter carinulatis, carinulis numerosis, superis distantioribus; interstitiū liris obliquis corrugato-clathratis; labro simplici; umbilico peramplo.*

Hab. — ?

Shell orbicular, somewhat discoid ; spire rather depressed, longitudinally keeled, keels numerous, upper ones wider apart ; interstices latticed in a wrinkled manner, with oblique ridges ; inner lip simple ; umbilicus very large.

Hab. Straits of Malacca, 17 fathoms. (Mus. Cuming.)

Delphinula Reeviana, Hinds, Proc. Zool. Soc. 1843.

CYCLOSTREMA COBIJENSIS, Reeve. *C. testā turbinatā, minutā, anfractibus convexis, carinulis transversis et longitudinalibus aequidistantibus regulariter clathratis; umbilico mediocri; labro simplici.*

Hab. Cobija, Peru.

Shell turbinate, very small ; whorls convex, regularly latticed, with equidistant, transverse and longitudinal ribs ; umbilicus moderate ; lips simple.

Hab. Port of Cobija, Peru, under stones in rocky places, low water ;

H. C. (Mus. Cuming.)

Delphinula Cobijensis, Reeve, Proc. Zool. Soc. 1843.

CYCLOSTREMA SPIRULA, Adams. *C. testā orbiculari, discoidē, erolutā; spirā depresso-concava, anfractibus rotundatis, primis*

contiguis, ultimā distinctā, transversim costulatis, costellis subconfertis, aequidistantibus; interstitiis tenuissimè longitudinaliter striatā; aperturā circulari; peritreme continuo.

Hab. in insulis Philippinis. (Mollusca, Pl. VIII. fig. 22.)

Shell orbicular, discoid, evolute; spire depressedly concave; whorls rounded, the first contiguous, the last separate, transversely ribbed, ribs equidistant, close together; interstices very finely longitudinally striated; aperture circular; peritreme continuous.

Hab. Philippine Islands. (Mus. Cuming.)

CYCLOSTREMA CINGULIFERA, Adams. *C. testā orbiculari, nitida; spirā depressā, anfractibus rotundatis, carinulis transversis, acutis, aequidistantibus; interstitiis (sub lente) tenuissimè longitudinaliter striatis; aperturā subcirculari, supra subangulata; umbilicō mediocri.*

Hab. in insulis Philippinis.

Shell orbicular, shining; spire depressed; whorls rounded, with equidistant, small, acute, transverse keels; interstices (under the lens) very finely longitudinally striated; aperture subcircular, angulated above; umbilicus moderate.

Hab. Dumaguete, island of Zebu, 4 fathoms; *H. C.* (Mus. Cuming.)

CYCLOSTREMA NITIDA, Adams. *C. testā orbiculari, lāvi, tenui, nitida; spirā elevatiuscula, anfractibus prope suturam subangulatis; suturis profundis, subcanaliculatis; aperturā subcirculari, supra angulatā; umbilico magno, peromphalo angulato, acuto.*

Hab. in insulis Philippinis.

Shell orbicular, smooth, shining; spire rather elevated; whorls somewhat angulated near the suture; suture deep, subcanaliculated; aperture subcircular, angulated above; umbilicus large, peromphalus acutely angulated.

Hab. Catanauan and Sual, island of Luzon, 10 fathoms, sandy mud; *H. C.* (Mus. Cuming.)

CYCLOSTREMA PLANORBULA, Adams. *C. testā orbiculari, planorbula; spirā depressā, anfractibus lāvibus, rotundatis, suturis distinctis; aperturā subcirculari, supra angulatā; umbilico permagno, patulo.*

Hab. in insulis Philippinis.

Shell orbicular, planorbular; spire depressed, whorls smooth, rounded, suture distinct; aperture subcircular, angulated above; umbilicus very large and open.

Hab. Sual, island of Luzon, 10 fathoms, sandy mud; *H. C.* (Mus. Cuming.)

CYCLOSTREMA PLANA, Adams. *C. testā orbiculari, dorso plano-convexā; spirā depressā, anfractibus planis, supra transversim striatis, infra lāvibus; aperturā subcirculari, supra angulatā; umbilico peramplo, anfractibus intus conspicuis.*

Hab. in insulis Philippinis.

Shell orbicular, back plano-convex; spire depressed, whorls flat-

tened, above transversely striated, below smooth ; aperture subcircular, angulated above ; umbilicus very wide, the whorls visible within it.

Hab. Dumaguete, island of Negros ; *H. C.* (Mus. Cuming.)

CYCLOSTREMA MICANS, Adams. *C. testá turbinatd, minutd, albd, nitidá, anfractibus convexis, longitudinaliter obliquè costellatis, transversim carinulatis, carinulis nodulosis; umbilico mediocri; aperturd circulari; peristome continuo, incrassato.*

Hab. Australia.

Shell turbinated, small, white, shining, whorls convex, longitudinally obliquely ribbed, transversely carinated, keels nodulous ; umbilicus moderate ; aperture circular ; peristome continuous, thickened.

Hab. Port Lincoln ; Metcalf. (Mus. Cuming & Metcalf.)

CYCLOSTREMA ELEGANS, Adams. *C. testá orbiculari, discoideò, tenui, semipellucidá; spirá depresso, anfractibus rotundatis, transversim omnino striatis; suturis distinctis; aperturd subcirculari, supra angulata; umbilico peramplo.*

Hab. in insulis Philippinis.

Shell orbicular, discoid, thin, semipellucid ; spire depressed, whorls rounded, entirely transversely striated ; suture distinct ; aperture subcircular, angulated above ; umbilicus very wide and open.

Hab. Sibonga, island of Zebu, 10 fathoms, sandy mud ; *H. C.* (Mus. Cuming.)

CYCLOSTREMA SULCATA, Adams. *C. testá orbiculari, discoideò; spirá planiuscula, anfractibus convexis, costellis transversis confertis regularibus, interstitiis profundè sulcosis; suturis profundis canaliculatis; umbilico patulo; peromphalo lœvi.*

Hab. in insulis Philippinis.

Shell orbicular, discoid ; spire rather flattened, whorls convex, with regular, transverse, small ribs, numerous and close together, interstices deeply grooved ; suture canaliculated ; umbilicus open ; umbilical area smooth.

Hab. Tambay, island of Negros, coarse sand, 6 fathoms ; *H. C.* (Mus. Cuming.)

CYCLOSTREMA ANGULATA, Adams. *C. testá orbiculari, discoideò; spirá depresso, anfractibus transversim costellatis, costellis regularibus, æquidistantibus, interstitiis tenuissimè striatis; anfractu ultimo biangulato, supra costellato, in media plano, infra costellato; aperturd subangulata; peritreme interrupto; umbilico permagno.*

Hab. in insulis Philippinis.

Shell orbicular, discoid ; spire depressed, whorls transversely costellated ; ribs small, equal, equidistant, interstices very finely striated ; last whorl biangulated, costellated above, smooth in the middle, and ribbed beneath ; aperture somewhat angulated ; peritreme not continuous ; umbilicus very large.

Hab. Sibonga, island of Zebu, 10 fathoms, sandy mud ; *H. C.* (Mus. Cuming.)

SEPARATISTA, Gray.

Animal ignotum. Operculum — ? Testa orbicularis, subdiscoidea, anfractibus primis contiguis, ultimo distincto; apertura patula, effusa, angulis subcanaliculatis; umbilicus magnus, infundibuliformis, usque ad apicem.

Shell orbicular, somewhat discoid, the first whorls contiguous, the last disunited; aperture wide-spreading, angulated; umbilicus large, infundibuliform, the whorls visible within as far as the apex.

The *Cornu* of Schumacher and the *Lippistes* of Montfort, founded upon the *Argonauta cornu* of Fichtel, appear to belong to *Carinaria* of Lamarck. *Steira* of Eschscholtz would seem by the figure given in Oken's 'Isis' to be an *Atlanta* badly drawn in an inverted position, and indeed is founded upon the "Corne d'Ammon vivant" of Le-sueur, *Atlanta Peronii*.

Separatista, Gray (not described).

SEPARATISTA GRAYII, Adams. *S. testa spirâ depressâ, anfractibus carinulis quinque transversis; apertura oblongo-transversâ; labio reflexo, anticè rotundato.*

Hab. apud Promontorium Bonae Spei.

Shell with the spire depressed, whorls with five transverse keels; aperture transversely oblong; inner lip reflexed, anteriorly rounded.

Hab. Cape of Good Hope. (Mus. Cuming.)

SEPARATISTA CHEMNITZII, Adams. *S. testa spirâ elevatâ, anfractibus carinulis tribus transversis; apertura subcirculari; labio subreflexo, anticè producto, angulato.*

Hab. in insulis Philippinis.

Shell with the spire elevated, whorls with three transverse keels; aperture subcircular; inner lip somewhat reflexed, anteriorly produced and angulated.

Hab. Island of Bureas, Philippines; H. C. (Mus. Cuming.)
Turbo separatista, Chemnitz.

PROFESSOR OWEN communicated a Memoir *, in continuation of his previous papers published in the Transactions (vol. iii. pp. 243, 307, 345), on the Gigantic Wingless Birds of New Zealand.

Having in the previous Memoirs determined and referred to their genera and species the different bones of the leg, he made those of the foot the subject of the present communication, which was illustrated by the exhibition of an extensive series of remains from both the North and South (or Middle) islands of New Zealand; comprising the entire series of phalanges of one and the same foot of the *Palapteryx robustus*, a gigantic species from Waikawaite; a similarly complete series of the *Dinornis rheides*; and series more or less incomplete of the phalanges of the *Dinornis giganteus*, *Palapteryx ingens*, and other genera and species of the singular extinct wingless birds of New Zealand. The characteristics of the different phalanges

* This paper will be printed in the Transactions, vol. iv. Part 1.

were minutely detailed, and the different proportions of the toes characteristic of different species, especially of the two most gigantic, viz. the *Dinornis giganteus* of the North island, and the *Palapteryx robustus* of the turbary deposits of the Middle island. The adaptation of the claw-bones for scratching up the soil was obvious from their shape and strength. The generic distinction of *Palapteryx* had previously been indicated by a slight depression on the metatarsus, supposed by the author to be for the articulation of a small back-toe, as in the *Apteryx*; and he had since received a specimen of the principal bone of that toe, which was exhibited and described. A nearly entire sternum, a portion of a minute humerus, and a cranium of one of the smaller species of *Dinornis*, were also exhibited and described.

This magnificent series of remains of great New Zealand birds had been collected chiefly by the late Colonel Wakefield, and had been transmitted to the author through the kind interest of J. R. Gowen, Esq., a Director of the New Zealand Company.

March 12, 1850.

W. Spence, Esq., F.R.S., in the Chair.

The following papers were read :—

1. FIRST THOUGHTS ON A PHYSIOLOGICAL ARRANGEMENT OF BIRDS. BY EDWARD NEWMAN, F.L.S., F.Z.S. ETC.

The systematic arrangement of the Class Aves is more unsettled than that of any other portion of the animal kingdom, a circumstance that may fairly be attributed to our attaching too high a value to characters purely structural or admensural, while we neglect others more intimately connected with reproduction; in a word, to the substitution of physical for physiological characters. In mammals, reptiles and fishes, we have a primary division based entirely on physiology: thus mammals are placental or marsupial; reptiles are oviparous or spawning; fishes are viviparous or spawning; and this primary division of these classes is admitted by all physiologists to be strictly natural. Notwithstanding, however, the purely physiological character, on which these primary divisions depend, it is found that physical characters harmonise with physiological, and that intimate structure in each instance bears out physiological difference. It were not wise altogether to discard structural differences even in the outset of an inquiry into system, but it is necessary to use them rather as corroborative than as indicative; and above all to draw a distinct and permanent line between such as are truly intimate and such as are purely adaptive. It has always appeared to me that one of the chief advantages of an extensive Vivarium like that possessed by our Society is the opportunity it affords for studying animated nature in an ani-

mated state, for ascertaining physiological as well as physical characters. If then we avail ourselves of the opportunities which are or ought to be thus afforded us, we shall find that in the very outset of life a physiological character of the most obvious kind will divide birds into groups as distinct as are the placental and marsupial mammals, or the cartilaginous and bony fishes. Prior to the extrusion of the egg, observed facts bearing on this subject are so few and so unconnected that they cannot be rendered available as affording evidence on the question to be considered; it is therefore compulsory that our comparisons begin at that moment when the condition of the young becomes patent by the breaking of the shell. Commencing the inquiry at this point, which may safely be regarded as analogous to the birth of a placental animal, we have this obvious grand division of the class:—

1. *Hesthogenous Birds.*—In these, immediately the shell is broken the chick makes its appearance in a state of adolescence rather than infancy: it is completely clothed, not with such feathers as it afterwards wears, but still with a close, compact, and warm covering: it possesses the senses of sight, hearing, smelling, &c. in perfection: it runs with ease and activity, moving from place to place at will: it perfectly understands the signals or sounds uttered by its parent, approaching her with alacrity when invited to partake of food she has discovered, or hiding itself under bushes, grass, or stones, when warned of danger; in either case exhibiting a perfect and immediate appreciation of its parent's meaning: it feeds itself, pecking its food from the surface of the earth or water, and not receiving it from the beak of its parent: although entering on life in this advanced state, it grows very slowly, and is long in arriving at maturity. When full-grown it uses its feet rather than its wings: it trusts much to its legs for means of escape: when it flies, it moves through the air by a series of rapid, powerful, laboured strokes of the wing, and invariably takes the earliest opportunity of settling on the land or water, not on trees; it never takes wing for recreation or food, but simply as a means of moving from place to place: it is polygamous in its habits; the number of females predominating over the males: the males are pugnacious, they accompany the females only until incubation has commenced, and abandon the duties of incubation and the care of the young solely to the females: the females make little or no nest, a depression scratched on the surface of the soil generally sufficing: the eggs are large in comparison to the size of the bird: neither sex sings, or attempts to imitate the voice of men or animals. Birds included in this division approach more nearly to mammals than do those which it excludes: for instance, the habitual use of land or water for progression, the swiftness of foot, the strength and muscular development of the legs, the polygamous habits, the want of the extraordinary instinct of nest-making, are characters which, while they seem to degrade these birds as birds, certainly raise them in the list of animals, because they are thus brought nearer those animals which suckle their young, and which are always placed at the head of the animal kingdom. In an econo-

mical point of view, and considered in reference to man, the flesh of these birds is wholesome, nutritious, and is generally considered highly palatable. The division comprises the following orders, in each of which partial exceptions to one or other of these general characters occur :—

1. Gallinæ, or the Poultry order.
2. Brevipennes (*Cuvier*), or the Ostriches.
3. Pressirostres (*Cuvier*), or the Plovers.
4. Longirostres (*Cuvier*), or the Snipes.
5. Macrodactyli (*Cuvier*), or the Rails.
6. Plongeurs (*Cuvier*), or the Divers.
7. Lamellirostres (*Cuvier*), or the Ducks.

2. *Gymnogenous Birds*.—In these, when the shell is broken, the chick makes its appearance in a state of helpless infancy : it is naked, blind, and incapable of locomotion : it cannot distinguish its parent by means of its senses : it gapes for food, but does not distinguish between proper food offered by its parent, and a stick or a finger held over it : it cannot feed itself, and would die were not food placed in its mouth : it rapidly attains its full size, often before leaving the nest. When full-grown it uses its wings rather than its feet : it flies with a succession of deliberate and easy strokes : it takes wing for recreation and for food, and not merely for the purpose of moving from place to place : it is strictly monogamous ; the sexes being equal in number : males share with females the cares of incubation and feeding the young until these are able to shift for themselves. Birds possessing these characters build elaborate nests in trees, and perch in trees rather than on the ground : many of them sing melodiously ; others imitate, with wonderful facility, the voice of man or of animals. As an economical character in connexion with man, their flesh is bitter and unpalatable, often offensive and disgusting ; hence man has never domesticated them for purposes of food. These are birds *par excellence* : they possess in perfection the essential characters of birds : in the habitual use of air for progression and of trees for resting, in the want of abilities for terrestrial progression, in strength and bulk of pectoral muscle, in monogamous habits, in the fabrication of nests, in power of song, they are raised as birds, but degraded as animals, since in all these characters they recede from those animals which suckle their young. The division comprises the following groups, in each of which exceptions to one or other of the general characters occur :—

1. Totipalmes (*Cuvier*), or the Pelicans.
2. Longipennes (*Cuvier*), or the Gulls.
3. Accipitres, or the Birds of Prey.
4. Cultriostres (*Cuvier*), or the Herons.
5. Passeres, or the Sparrow order.
6. Grimpeurs (*Cuvier*), or the Climbing birds ; and
7. Columbæ, or the Pigeons.

2. ON A NEW SPECIES OF LYMNÆA FROM THIBET.
BY LOVELL REEVE, F.L.S., F.Z.S. ETC.

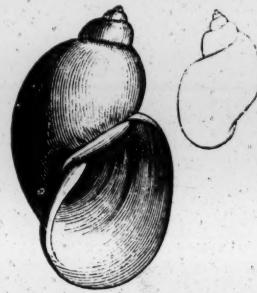
LYMNÆA HOOKERI. *Lymn. testa ovalis, tenuicula, conspicue umbilicata, anfractibus quatuor ad quinque, convexis, superne depresso-rotundatis, suturis subimpressis, apertura orbiculari-orata, marginibus laminae latiuscula subverticali conjunctis; sordide olivaceo-fusca.*

The above-described freshwater mollusk, collected by Dr. Hooker on the Thibetian or north side of Sikkim Himalaya, at 18,000 feet elevation, belongs to the same type as our well-known *Lymnaea peregra*, and affords an interesting addition to the evidence which has been in part collected touching the wide geographical distribution of corresponding forms of plants and animals over those parts of Europe and Asia where there are no extensive mountain-barriers. The European *Lymnaea stagnalis* has been collected as far east as Afghanistan, and the typical form of *Lymnaea peregra* is very characteristic in this species from Thibet. A depression of the whorls next the sutures, which gives a more orbicular form to the aperture, and a conspicuous umbilicus, which is not in any degree covered by the columellar lamina, prove it to be specifically distinct from *L. peregra*; and these characters do not appear in the various modifications of that species arising out of its more or less ventricose growth, or more or less attenuated convolution. South of the Himalaya range, where Dr. Hooker reckons the snow-line to be 5000 feet lower than on the north side, and 3000 feet lower than the locality inhabited by this species, the *Lymnaeæ* are of quite a different type, more especially in the plains of Bengal, where the shell, owing to its being formed in so much warmer a temperature, is of stouter growth, and characterized by some design of colouring. The European types of *Lymnaea*, ranging over Russia and Siberia, appear abundantly in the stagnant waters of North America; and some are identical in species. *L. elodes* of Say, inhabiting Pennsylvania, is doubtless the same species as the European *L. palustris*; *L. truncatula* of the same author appears to be identical with *L. desidiosa*; and the *L. peregra*, represented by *L. Hookeri* in Thibet, is represented in Pennsylvania by Say's *L. catascopium*. The *Lymnaeæ* of Australia are of a remarkable and very distinct type from either of those mentioned above.

I have much pleasure in naming this Thibetian *Lymnaea* after the indefatigable traveller, whose researches into the natural and physical history of that remote country into which few have penetrated, are likely to be attended with such important results. I have placed the specimens in the British Museum.

The figure in outline is of the natural size.

No. CCIV.—PROCEEDINGS OF THE ZOOLOGICAL SOCIETY.



3. ON THE ANIMAL OF LIOTIA; WITH DESCRIPTIONS OF NEW SPECIES OF DELPHINULA AND LIOTIA, FROM THE CUMINGIAN COLLECTION. BY ARTHUR ADAMS, R.N., F.L.S. ETC.

(Mollusca, Pl. VIII. fig. 18, 19, 20.)

An examination of the animal of *Liotia Peronii* tends to confirm the generic importance of a small group hitherto confounded with *Cyclostrema* and *Delphinula*, but which had been justly recognised by Mr. Gray under the name of *Liotia*. The shell is known by its thickened peritreme; the operculum is peculiar, and the habits are peculiar in living at considerable depths, while *Delphinula* proper are chiefly littoral. In *Liotia* the head is proboscisidiform, the tentacles subulate, the eyes on conspicuous peduncles at their outer bases; there are no intertentacular lobes, but a conical lobe on each side of the head external to the eye-peduncles; the lateral membrane of the foot is undulated, and furnished posteriorly with three cirri.

The operculum is arctispiral, the volutions being very narrow, numerous, and covered with a calcareous deposit, which is articulated at regular intervals, giving the upper surface of the operculum a tessellated appearance; the periphery is ornamented with radiating, horny fibres.

LIOTIA PULCHERRIMA, Adams. *L. testa subdiscoidea; spira ele- ratiuscula, anfractibus rotundatis, liris transversis et longitudinalibus elegantissime cancellata, liris transversis muricatis; labro expanso, duplicati, radiatim fimbriato; umbilico per- amplo, crenulato.*

Hab. apud Promontorium Bonae Spei. (Mollusca, Pl. VIII. fig. 21.)

Shell subdiscoid; spire slightly elevated, whorls rounded, very elegantly cancellated with transverse and longitudinal raised ridges, the transverse being muricated; outer lip expanded, with a double peritreme, each being radiately fimbriated; umbilicus very large, the margins crenulated.

Hab. Cape of Good Hope. (Mus. Cuming.)

LIOTIA AFFINIS, Adams. *L. testa globosa; spira sub prominula, anfractibus rotundatis, transversim elevato-striatis, costis variciformibus longitudinalibus, distantibus, angulatis, mucronatis; anfractuum parte inferiori serie unica foraminum; labro expanso; umbilico patulo, crenulato.*

Hab. in littoribus Australiae.

Shell globose; spire rather prominent, whorls rounded, transversely elevately striated, with variciform longitudinal ribs, wide apart, angulated, and with the angles furnished with sharp points; lower part of the whorls with a single row of holes; outer lip expanded; umbilicus wide, crenulated.

Hab. Australia. (Mus. Cuming.)

A species partaking of the characters of *L. scalaroides* and *L. varicosa* of Reeve, but which can be referred to neither.

LIOTIA DUPLICATA, Adams. *L. testā orbiculari; spirā de-
pressa, anfractibus transversim et longitudinaliter costatis;
costis transversis duabus, tuberculatis; anfractuum parte in-
feriori planā; umbilico ampio, perspectivo, crenulato.*

Hab. in insulis Philippinis.

Shell orbicular; spire depressed, whorls transversely and longitudinally ribbed; transverse ribs two, tuberculated; the lower part of the whorls smooth; umbilicus very large, the other whorls visible within, margin crenulated.

Hab. Cagayan, province of Misamis, Isle of Mindanao, Philippines. (Mus. Cuming.)

LIOTIA NODULOSA, A. Adams. *L. testā orbiculato-depressa;
spirā complanatā, transversim striatā, ultimo anfractu costis
transversis duabus in medio punto sulcatis et nodulis magnis
substantibus instructis, infra serie punctorum circa regionem
umbilicalem; aperturā orbiculari, peristomate refleco puncto
fimbriato, umbilico patulo margine crenulato.*

Hab. in insulis Philippinis. (Mus. Cuming.)

DELPHINULA CORONATA, Adams. *D. testā subdiscoidea, albā,
nigro lineatā; anfractibus rotundatis, supra, spinis squamæ-
formibus subramosis nigricantibus sursum curvatis coronata;
anfractuum parte alterā spinis brevioribus nigris in seriebus
dispositis; spirā plano-convexa.*

Hab. in littoribus Australiæ.

Shell subdiscoid, white, with black lines; whorls rounded, coronated above with blackish subramose scale-like spines curved upwards, the other part of the whorls with shorter black spines arranged in parallel rows; spire plano-convex.

Hab. Cape Upstart, North Australia, in crevices of rocks at low water; Jukes. (Mus. Cuming.)

DELPHINULA EURACANTHA, Adams. *D. testā subdiscoidea, al-
bida fusco rubroque variegatā, anfractibus supra lœvigatis, su-
pernè angulatis, angulo spinis squamaformibus grandibus latis
decurvatis ornato; anfractuum parte inferiori serie unica spi-
narum et squamarum in seriebus parallelis dispositis ornata;
umbilico ampio, squamis muricatis armato, peromphalo nodoso.*

Hab. in insulis Philippinis.

Shell subdiscoid, whitish varied with red and brown; whorls smooth above, angulated superiorly, the angle ornamented with large wide decurved scale-like spines; lower part of the whorl with a single series of spines and numerous parallel rows of scales; umbilicus wide, armed with muricated spines, margin nodose.

Hab. Isle of Mindoro, Philippine Islands; H. C. (Mus. Cum.)

Like *D. aculeata*, Reeve; but the spinose processes are broad and deflexed, and there is a single row of large spines on the under part.

DELPHINULA CALCAR, Adams. *D. testā orbiculari, discoidea;
spirā depressa, albd, anfractibus angulatis acutis, peripheria
serie unicā spinarum radiatim stellata, spinis triangularibus*

compressis prominentibus; anfractuum parte inferiore plana;
umbilico patulo, crenulato.

Hab. in insulis Philippinis.

Shell orbicular, discoid; spire depressed, white, whorls sharply angulated, periphery with a single series of prominent broad triangular compressed spines radiately disposed; lower part of whorls smooth; umbilicus wide, crenulated.

Hab. Catanuan, province of Tayabas, island of Luzon, sandy mud, 10 fathoms; *H. C.* (Mus. Cuming.)

A small species, partaking somewhat of the characters of *D. stellaris*, Adams and Reeve, but much more depressed, and the lower part of the whorls simple.

March 26, 1850.

W. Yarrell, Esq., V.P., in the Chair.

The following papers were read:—

1. ON A LEECH NEW TO THE BRITISH FAUNA.
 BY J. E. GRAY, Esq., F.R.S.

Mr. Hoffmann lately sent to the Zoological Gardens a living specimen of a very large leech which he had found near his house in the Regent's Park. It has been preserved in fluid, and now forms part of the Collection of British Animals in the British Museum.

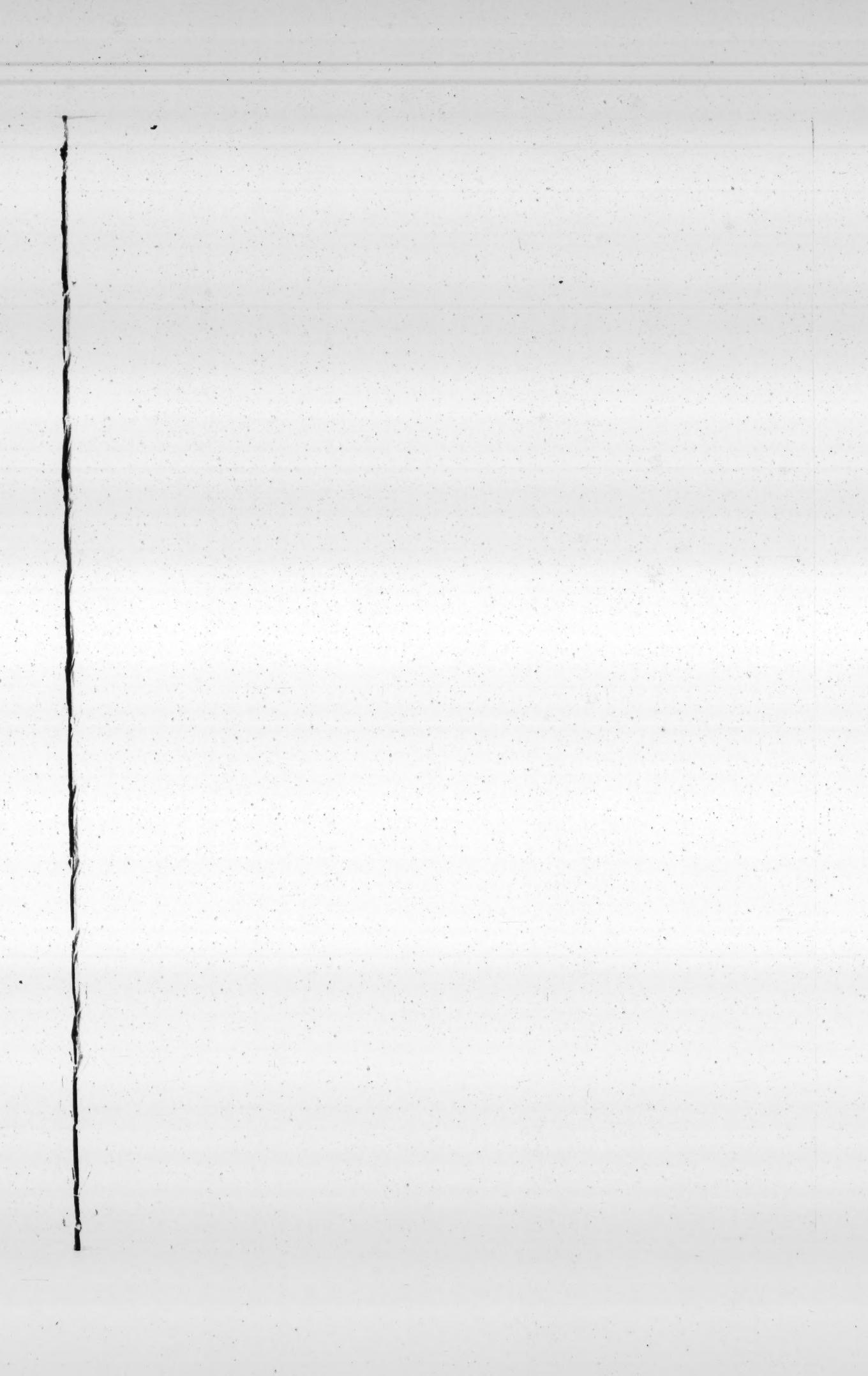
It proved to be an adult specimen of *Trocheta subviridis*, Dutrochet (*Lamk. Hist. A. s. V. v. 523*), well-figured in the 2nd edition of Moquin-Tandon's 'Monograph of Hirudines,' t. 4. It is a very interesting addition to the fauna. It is the giant of the family, this specimen being more than 7 inches long.

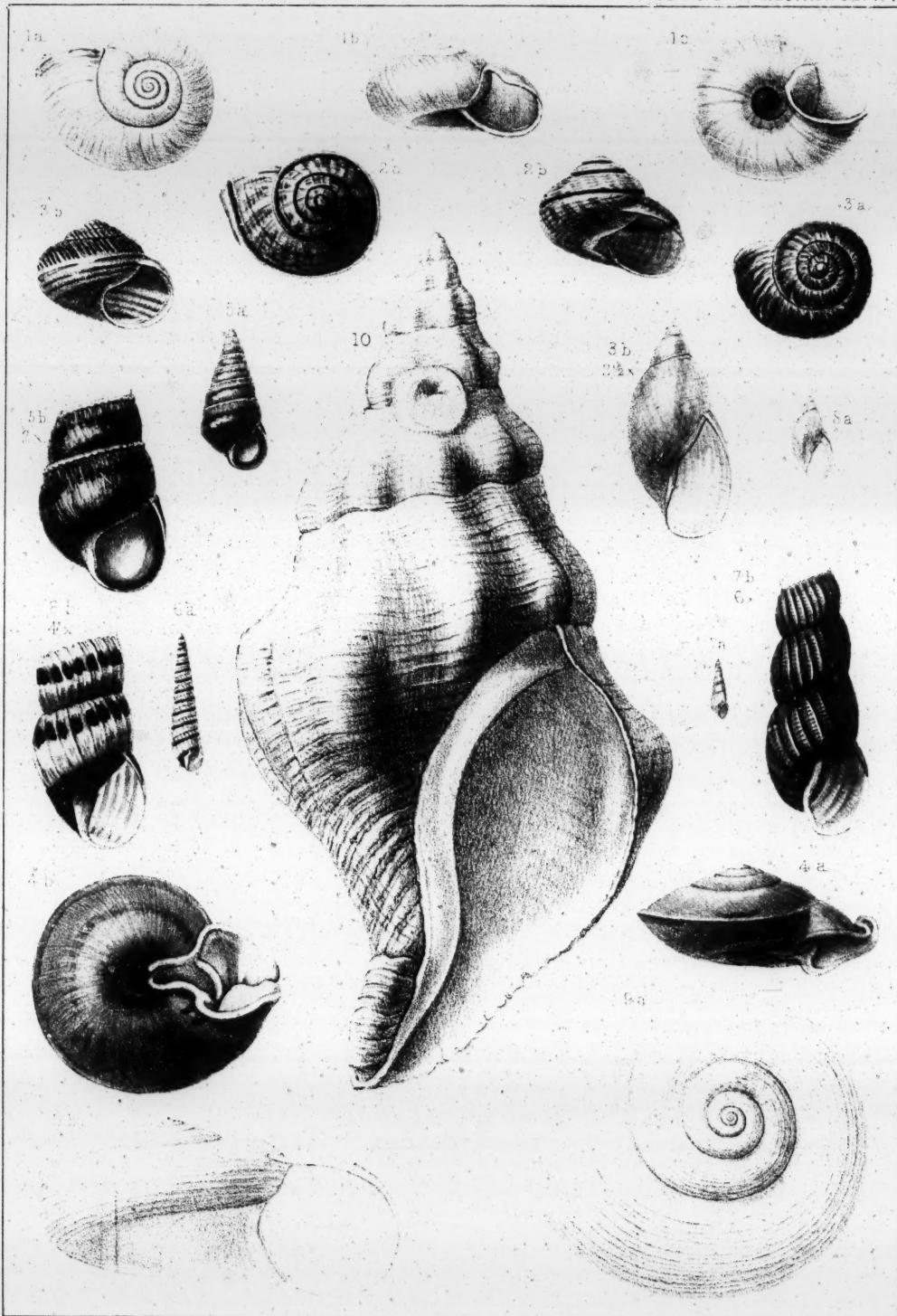
2. ON THE OCCURRENCE OF REGALECUS GLENE AT REDCAR,
 YORKSHIRE, IN 1850. BY J. E. GRAY, Esq., F.R.S.

A specimen of this fish was cast ashore on Redcar Sands, Yorkshire, on Thursday, the 3rd of January 1850. "The fish was alive when found. Length without the tail-fin, which is wanting, about 11 feet; width at the broadest part, 12 inches; weight, 4 stone 10 lbs."

It was salted and exhibited at Redcar. During the exhibition the rays of the dorsal and ventral fins were almost entirely destroyed, and it broke transversely into three nearly equal lengths on being moved from the sand.

It was eventually sent to London, and now forms part of the Collection of British Animals in the British Museum. The specimen, when it arrived in London, agreed in general appearance and in all essential characters with the specimen from Cullercoats which was exhibited in London last year. Mr. Wrightson, who had the care of it at Redcar, considered, because it had no expanded forked tail, that the tail was wanting.





W. B. Dally

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Fig. 6 a, b. *Buimus chemnitoides* Forbes
7 a, b. "fimbriatus"
8 a, b. *Succinea cingulata*.
9 a, b. *Cyclostoma purum*.
10. *Fusus Kelletii*

3. NOTE ON CALLICETHYS AND ANABLEPS.
BY J. P. G. SMITH, ESQ.

The flesh of *Callichthys*, when cooked, is of a fine deep yellow colour, and in substance is somewhat cheesy or buttery on the tongue; it is very rich in flavour: no cleaning of the intestines appears to be necessary before preparation for the table.

In the creeks by which the island of Mexiana is intersected, these fish literally swarm and keep the waters alive and in a state of constant disturbance. I have witnessed them crossing a log of wood, which was lying in the water and intercepted the passage, in such numbers that they quite concealed it from view; and the people, when they wanted a dish, were in the habit of going down to a favourable spot and picking them out with their hands, without going into the water.

Anableps swims in small shoals with the eyes above the surface of the water, generally close to the shore, and so near together that I have shot twenty to thirty at a time by firing a gun among them; their flesh is very sweet, and not unlike a smelt in taste.

4. ON THE SPECIES OF MOLLUSCA COLLECTED DURING THE SURVEYING VOYAGES OF THE HERALD AND PANDORA, BY CAPT. KELLETT, R.N., C.B., AND LIEUT. WOOD, R.N. BY PROFESSOR EDWARD FORBES, F.R.S.

1. *On the Land-Shells collected during the Expedition.*
(Mollusca, Pl. IX.)

Officers employed on a hydrographical survey have seldom time or opportunity for making an extensive collection of land-shells. In the assemblage of mollusks collected by Capt. Kellett and Lieut. Wood, there are twenty-eight species, of which eight are undescribed forms. These have been collected at various points between the coast of the Ecuador to the south and Vancouver Island to the north, the Galapagos Islands, Pitcairn's Island, and the Sandwich Isles. Unfortunately, in consequence of the mixing of unlabeled specimens, the precise locality of several of the species cannot now be determined.

Of the genus *Helix* there are nine species. Of these, *H. Townsendiana*, *Nuttalliana* and *Columbiana* are certainly from the neighbourhood of the Columbia river. *Helix Kelletti* and *Pandora*, both new, are probably from the same country, though the box in which they were contained was marked "Santa Barbara." *Helix areolata* bears no indication of its locality. *Helix labyrinthus*, variety *sipunculata*, is a very curious modification of *H. labyrinthus*, and, like its known near relations, comes from Panama. *Helix ornatella* (known also as *H. Adamsi*) was collected in Pitcairn's Island, where it had originally been observed. A single specimen of the common European *Helix aspersa* is marked "Santa Barbara," and probably owed its presence, wherever it was found, to transport by Europeans.

Of the genus *Bulimus* fourteen species were collected. Among the most interesting of these are seven species, two of them new, from

Chatham Island, one of the Gelepagos group. Five, viz. *nux*, *calvus*, *eschariferus*, *unifasciatus*, and *rugulosus*, are described forms; two, to which I have applied the names *chemnitzioides* and *achatellinus*, are new, and very curious. Of these latter, the first is singularly isolated in many of its features, though bearing a resemblance sufficient to indicate an affinity with certain elongated and turreted *Bulimi*, natives of South America. The other is equally distinct from any known members of this genus; but, moreover, instead of linking, as the majority of the Gelepagos land-shells do, the fauna of those singular islands with the American continent, rather points, as it were, in the opposite direction, and distantly indicates affinity with the fauna of the Sandwich Isles.

Unfortunately less certain as to exact locality, though contained in a box labeled "Panama," is a curious small elongated *Bulimus*, to which I have given the name *fimbriatus*. A form such as this, suggests, when we bear in mind the varied characters of its congeners, considerable doubts as to the value of the generic sections at present generally received among the Pulmoniferous Mollusea. We speak of *Bulimus*, *Helix*, *Pupa*, *Achatina*, and *Balea*, as if they were so many marked groups, the species in each assimilating to ideal generic types, whereas the difference between certain forms of so-called *Bulimi* and others placed under the same generic name is greater than between many *Bulimi* and *Helices* or *Pupae*. Without assenting to the views of Féruccac, which would have amalgamated the genera into one, on account of the similarity in external characters of the soft parts of the animal, and fully admitting that in certain tribes the shell alone may become a most important source of generic character—in other words, granting that in certain groups the sources of generic distinction may lie in the pneumo-skeleton—I do think that we have not yet attained a natural arrangement of the Pulmoniferous Mollusks, and until we have solved that problem, we shall be seriously impeded in the study of the laws of their distribution as well as of their organization.

Besides the *Bulimi* already named, there are specimens of *Bulimus iostomus*, *B. Hartwegii*, and a beautiful new species lately described and figured by Mr. Reeve under the name of *Bulimus Kelletii*, all probably from the Ecuador; *Bulimus alternatus*, from Panama; and *Bulimus miltecheilus*, marked from the Sandwich Islands, though this curious and beautiful shell is not known to inhabit that locality; nor have we evidence sufficient that the specimen brought home by Lieut. Wood was gathered there. Hitherto it is only known from "San Christoval, south-eastern island of Solomon's Group, north-east coast of New Holland" (Reeve), from which locality the specimens in Mr. Cuming's collection were obtained, and the single example now referred to may have possibly been brought away from the same place.

Of the curious genus *Achatinella*, two species, *livida* and *alba*, are in the collection, both procured at the Sandwich Islands.

Of *Succinea* there is a new species, marked from Mazatlan; I have named it *Succinea cingulata*.

There are two species of *Cyclostoma*, the fine *C. grande* (no locality is attached to it), and an equally beautiful one which I have named *C. purum*.

The following diagnoses of the new species in the collection have been modeled on those of Dr. L. Pfeiffer, whose admirable 'Monographia Heliceorum Viventium' is one of the most valuable contributions to Malacology that have been published for many years.

HELIX PANDORE. *H. testd obteclè perforatd, depresso-globosù, tenui, rugulosa, concentricè minutissimè striatà, anfractibus supra peripheriam fuscis, infra et prope peripheriam albidis fusco cingulatà, basi albidis; aperturd rotundatà intus fusco albido-fuscata, margine interno incrassato albo; peristomate reflexusculo, extus albo-labiato, margine columellari dilatato, reflexo, umbilicu-
cum occultante.*

Diam. max. 17, min. 16, alt. 14 mill. (Pl. IX. fig. 3 a, b.)

Collected near the Straits of Juan del Fuaco; allied to the last species, but very distinct.

HELIX KELLETTII. *H. testd angustè umbilicatà, depresso-globosù, tenui, rugulosa, granulatà, fulvà, spirà subturbinatà, sordide flavo conspersa, rufo-unifasciatà, anfractibus 6, convexiusculis, ultimo ad peripheriam fasciù pallidà cincto, basi subinflato; aperturd lunato-rotundatà, intus pallide fusco, unifasciatà; peristomate reflexusculo, margine columellari dilatato, reflexo, umbilicum oc-
cultante.*

Diam. max. 22, min. 19, alt. 19 mill. (Pl. IX. fig. 2 a, b.)

This species is nearly allied to *Helix Californiensis*, Lea. It differs in the more pyramidal contour of the spire, in the less tumid body-whorl, and consequently differently shaped, more lunate, slightly elongated mouth. The margin of the mouth is more reflected.

HELIX VELLICATA. *H. testd apertè umbilicatà, tenui, convexo-depressa, subnitidà, sulcato-striatà, striis minutissimis spiralibus decussatà, lète viridibus; spirà convexiuscula, anfractibus 6, ulti-
mo rotundato magno, anticè dilatato, subdescendente; aperturd perobliqua, lunato-oblonga; faux alba, peristomate margine sub-
reflexo, supernè deflexo-sinuato.*

Diam. max. 22, min. 18, alt. 8 mill.

From Panama? (Pl. IX. fig. 1 a, b, c.)

Distinguished from its near allies by the peculiar deflexion of the upper portion of the lip-margin.

BULIMUS CHEMNITZIOIDES. *Bul. testd subperforatd, turrito-
subulatà, regulariter costatà, costis numerosis, nitidulis, flavidulà,
fuscà spirali fusco-purpurei cincta; anfractibus 14, ultimo $\frac{1}{3}$
longitudinis subaequante, basi fusco-purpureo; columellà subrectà,
albidà; peristoma simplex, acutum; margine externo supernè arcu-
ato; aperturd ovali-oblonga.*

Long. 19, diam. 4 mill.; apert. 3 mill. longa, 2 lata.

Chatham Island, Gelepagos. (Pl. IX. fig. 6 a, b.)

This beautiful species strikingly resembles a marine *Chemnitzia*.

It is very distinct from any known *Bulimus*, but has affinities with *B. terebralis*, *B. columellaris*, and *B. clausilioides*.

BULIMUS FIMBRIATUS. *Bul. testá imperforatá, subuliformi, tenui, costis longitudinalibus subarcuatís, lineis confertis parallelis in interstítii costarum sculpta, rufo-fuscá, suturá impressa; anfractus 7-8, tumidi, ultimus $\frac{1}{3}$ longitudinis vix superans, infra medium obsoletè carinatus; columella subsimplex, ad basim aperituræ angulum formans; apertura subovalis; peristoma simplex.*

Long. 9, diam. 2 mill.; apert. 2 mill. longa, 1 lata.

(Pl. IX. fig. 7 a, b.)

In a box of shells labeled "Panama." The nearest ally of this very curious shell is the *Bulimus gracillimus* of Pfeiffer, from Cuba.

BULIMUS ACHATELLINUS. *Bul. testá perforatá, umbilico parvo, conicá, obsoletè striatá, nitidulá, flavidá, fusco-fasciatá; suturá cingulatá, crenulatá, albida; anfractibus 7-8 convexiusculis, ultimo vix $\frac{1}{2}$ longitudinis aequante; apertura semiovalis, peristoma rectum, simplex, acutum; columella obsoletè contorta, margine columellari reflexo, perforationem semitegente.*

Long. 19, diam. 10 mill.; apert. 5 mill. longa, 4 lata.

(Pl. IX. fig. 5 a, b.)

This shell is from Chatham Island, Gelepagos; it is unlike any other known *Bulimus*, and its characters distinctly indicate affinity with the *Achatinellinæ*.

SUCCINEA CINGULATA. *S. testá oblongo-ovatá, vix obliqua, solidula, striatá, nitidulá, fulvo-succinéa, sæpe spiraliter albo-lineata; spirá exserta, obtusa; anfractus 4, convexiusculi, ultimus $\frac{2}{3}$ longitudinis aequans; apertura elongato-ovatá, suprènè acutá, basi obliquè pone axin recedente; columellá arcuata.*

Long. 12, lat. 6 mill.; apert. 7 mill. longa, medio 3 lata.

(Pl. IX. fig. 8 a, b.)

This *Succinea* is distinct from any recorded by Pfeiffer. It is said to come from Mazatlan. The very fine white spiral lines are not always clearly marked in colour; they correspond with lines of deeper depression at intervals of the striae of growth.

CYCLOSTOMA PURUM. *C. testá orbiculari, depressa, albida, nitidula, spiræ elevatiuscula, luteola; anfractibus sex, rotundatis, spiraliter sulcatis, sulcis numerosis, transversè striatis; aperitura subcirculari, obliqua, peritreme simplici; umbilico maximo; operculo —?*

Diam. 48, alt. 17 mill. (Pl. IX. fig. 9 a, b.)

Very near *C. Cumingii*, a species described by Mr. G. Sowerby from the island of Tumaco.

5. ON THE CHARACTERS OF THE GENERA PUSIONELLA AND CLAVATULA. BY J. E. GRAY, F.R.S. ETC.

In the List of Genera of Mollusca published in the Proceedings for 1848, I gave the name of *Pusionella* to a genus of shell, referring to the *Nefal* of Adanson and the *Murex pusio* of Born as the type.

This genus is easily characterized by the smooth thin periostraca, and the sharp-edged oblique plait which crosses the lower part of the canal. At the time I formed the genus, which contains several species in my collection, all coming from Africa, I was convinced that it was separate from the other zoophagous mollusca, from the characters assigned to it above, though I am aware that several zoologists were inclined to consider that they were scarcely sufficient for the formation of a generic group.

The examination of the operculum of the shells arranged in this group has shown that it affords a most excellent character, which separates it at once from all the other genera of the family. The operculum is formed of concentric laminae, with the nucleus or first-formed lamina placed on the straight front or inner side of the operculum, which is situated next to the pillar of the shell. With this peculiarity the genus must now be regarded as firmly established. This form of operculum had only before been observed in the genus *Bezoardica*.

The discovery of this character in shells which had been regarded by most authors as *Fusi*, induced me to examine the opercula of some other allied genera, and I was rewarded by the discovery that *Pleurotoma bicarinata*, which is very nearly allied in form to *P. coronata*, the type of the genus *Clavatula* of Lamarck's 'System,' has the operculum of the same shape and formed nearly in the same manner as that of the genus *Pusionella*; while *Pleurotoma Babylonica*, *P. Virgo*, and *P. oxytrophis*, which may be regarded as the typical *Pleurotomæ*, have the ovate lanceolate operculum with the nucleus on the acute apex, like the typical *Fusi*.

This being the case, it appears to me desirable that the genus *Clavatula* should be re-established, and restored to the species which has the operculum of this kind. Should it be considered necessary to separate from *Pleurotoma* the species which have a very short anterior canal, which have hitherto been regarded as *Clavatulæ*, they may be called *Drilliae*, as that was the name which was first applied to them before they were confounded with the true *Clavatulæ*.

These observations show the importance of studying the opercula of the different genera; and I may add, that the attention which I have been able to bestow on the subject has convinced me that they form quite as important a character for the distinction of the genera, and the arrangement of the genera into natural groups, as the structure and form of the shelly valve, or of the external form of the animals themselves; and this may well be believed, when we consider them, as I am inclined to do, as an imperfectly developed valve, and as homologous to the second valve of the bivalve shell.

April 9, 1850.

Prof. Owen, V.P., F.R.S., in the Chair.

The following papers were read:—

**I. NOTICES OF AUSTRALIAN FISH. BY SIR JOHN RICHARDSON,
M.D., F.R.S. ETC.**

(Pisces, Pl. I. II. III.)

In the third volume of the 'Zoological Transactions,' the 'Magazine and Annals of Natural History,' vol. ix.; a report on the "Fish of New Zealand," made to the British Association in 1842; the Ichthyology of the Voyage of the Sulphur, and especially in the Ichthyology of the Antarctic Voyage of the Erebus and Terror, completed in February 1848, I have described various species of Australian fish. Among other sources of information to which I had recourse, a collection of drawings, made by Deputy Assistant Commissary General Neill, in 1841, at King George's Sound, is particularly valuable on account of the notices it contains of the habits and qualities of the fish. The drawings are so characteristic, that most of the species are easily recognised, but some novel forms could not be systematically described without specimens, and the opportunity now afforded me by Mr. Gray of inspecting a number of dried skins prepared on the spot by Mr. Neill, has given occasion to the present paper.

APISTES PANDURATUS, Richardson.

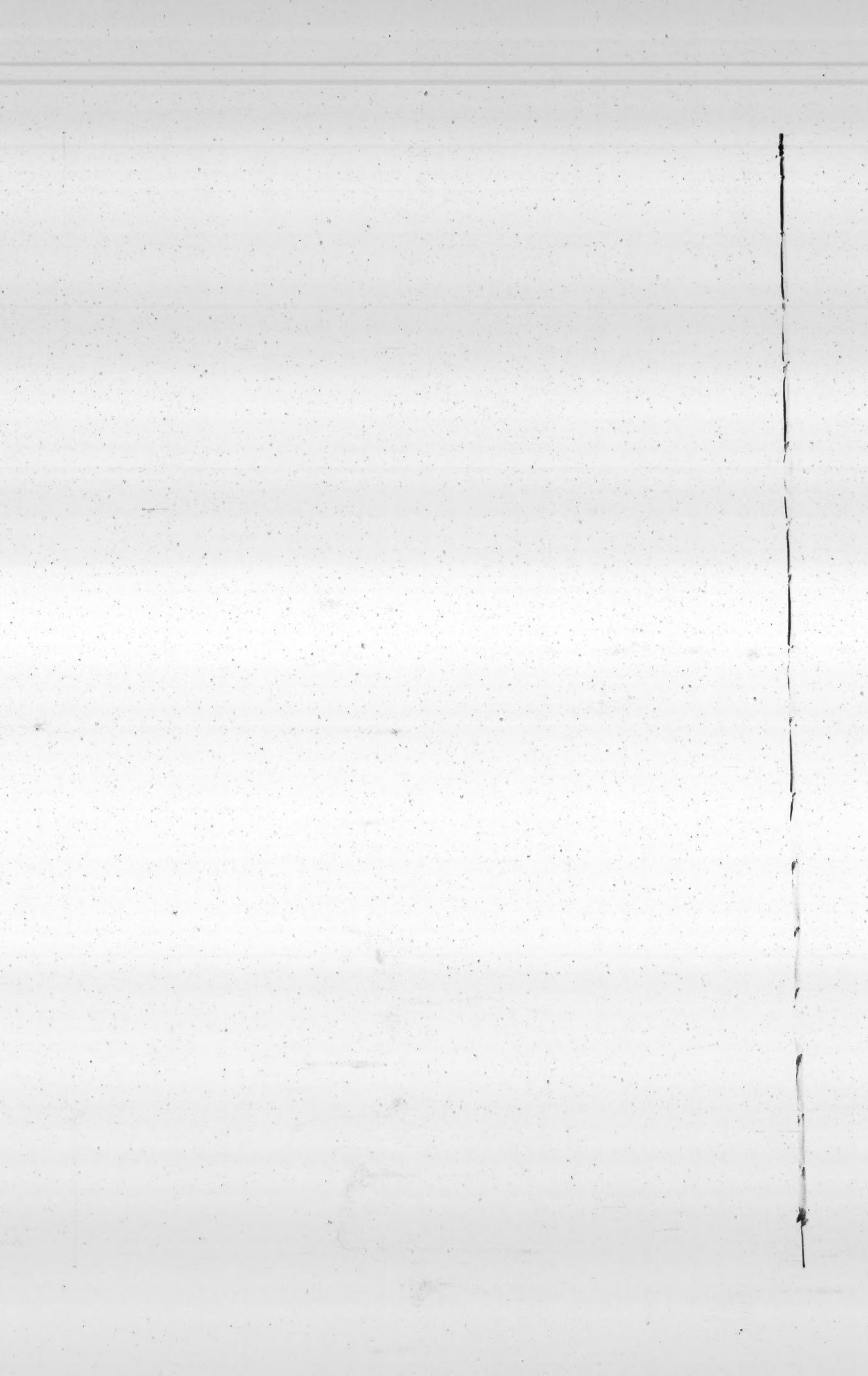
Radius.—B. 7; D. 17 $\frac{1}{2}$; A. 3 $\frac{1}{2}$; C. 12 $\frac{1}{2}$; P. 14; V. 1 $\frac{1}{2}$, spec.

(Pisces, Pl. I. fig. 3, 4.)

Among the various forms that the genus *Apistes* presents, the present one is remarkable for the elevation of the orbit, which rises in a semicircular protuberance, so high above the occiput as to give the hinder part of the head a relative depression like a Turkish saddle, and to render the snout and forehead almost vertical.

The mouth is terminal and small, and both jaws, with the chevron of the vomer and a round patch on each palatine bone, are furnished with minute, short villiform teeth. The intermaxillaries are moderately protractile, and the maxillary, whose dilated lower end drops below the corner of the mouth, has its posterior edge turned outwards producing a ridge. The nasal spines are thick, but acute, and are bent to the curve of the forehead. There is a narrow deep groove between them. This groove widens on the top of the head, where it is bounded by smooth ridges continued from the nasal spines, and in conjunction with them the raised edges of the orbits form an exterior furrow on each side. These four furrows and ridges end in obtuse eminences which cross from the superior-posterior angle of one orbit to the other. Behind them the skull sinks perpendicularly to the level of the nearly flat, depressed occiput, on which however the middle ridges are still visible. The preorbital is small, very uneven, and emits a





strong spine whose acute point reaches back to the middle of the orbit. The second suborbital in crossing the cheek to the hollow of the preoperculum forms a stout ridge of oblique, somewhat twisted and striated eminences, none of them spinous. The preoperculum has a smooth vertical upper limb, which shows as a narrow, slightly elevated ridge. At its curve or angle there is a strong spine, longer than the preorbital one, but not reaching quite to the gill-opening. A short thick spine is adnate to its base above, and a little way below it there is an acute spine half as long, which is followed by three other angular or spinous points on the lower limb of the bone*. Two prominent but smooth ridges exist on the gill-plate without any spinous points. On the suprascapular region there are two ridges, the upper one having three thick, striated eminences with acute points, and the lower one has two such eminences, with two small points more posteriorly.

There are no scales on any part of the head, and there is a smooth space along the base of the dorsal, which is widest towards the shoulder; the space between the ventrals and the breast anterior to them, with the base of the pectorals and their axils, are scaleless; the rest of the body, including the belly and integuments adjoining the anal, is densely covered with small scales. The lateral line is marked by a series of small eminences and is straight.

Judging from the numbers given in the 'Histoire des Poissons,' and also from the examination of several species not described in that work, the branchiostegous rays seem to vary in the *Apistes* from five to seven. In the species now under consideration there are seven rays, but the lowest one is very slender, and so closely applied to the following one that it can be detected only by dissection.

The dorsal commences between the second points of the suprascapular ridges and extends to near the caudal. Its spinous portion is much arched; the spines are strong and acute, and the seventh one is the tallest, being equal to two-thirds of the greatest height of the body; the other spines are slightly graduated, but the foremost three diminish more abruptly. The last spine is rather more than one-half as long as the soft rays or than the tallest spine. The last soft ray is bound at its base to the back by membrane, but this membrane does not reach to the base of the caudal. The anal terminates rather further from the latter fin, and has three strong spines, the second being the stoutest and as long as the third one; the soft rays surpass them by about a fourth part. The pectorals are large and obliquely semi-oval, the lower rays being the shortest. Their rays are forked, which is a characteristic mark of the genus, and is not common in the Cottoid family. The ventrals are also rather large, exceeding the anal a little in length and in spread. Their spine stands behind the pectoral axil and under the fourth dorsal spine.

The length of the head exceeds the height of the body, and is contained thrice and one-half in the whole length of the fish, caudal included. Length of specimen $5\frac{1}{2}$ inches.

* In the figure, the angle of the mandible being strongly represented, looks like a fourth angular point.

APLOACTIS MILESI, Richardson.

Radius.—Br. 5; D. 14|14; A. 12; C. 13; P. 11; V. 1|2, spec.
(Pisces, Pl. I. fig. 1, 2.)

This fish has the fins of a *Synanceia* with the lateral eyes and head of a *Scorpaena*, but instead of the ridges of the cranium, face and gill-covers ending in spinous points, they produce only obtuse knobs. Its teeth in character and position resemble those of *Pterois*, and its dermal spine-like scales are similar to those of *Centridermichthys* (Zool. of Voy. of Sulphur, p. 73). I am not quite sure that it corresponds in all its general characters with the *Aploactis aspera* of the 'Fauna Japonica' (pl. 22), but it comes sufficiently near to be included in the same generic group.

The form of the fish is rather elongated, the height of the body, which is a little less than the length of the head, being nearly one-fourth of the total length of the fish, caudal included. The compression of the head is moderate, its thickness being only one-third less than its height, and equal to about half its length. The mouth is terminal, cleft only a very short way backwards, but having a moderately large gape. The intermaxillaries are slightly protractile, and their edges and those of the mandible are covered with very short and minute, densely crowded teeth. The chevron of the vomer is similarly armed, but there are no teeth on the very narrow edges of the palate-bones, and the tongue, which is not in the least free at the tip, appears to be quite smooth. The premaxillaries are but slightly protractile, the tips of their pedicles when retracted not reaching half-way to the eye. The maxillaries have a protuberance in the centre of their lower dilated ends, and only their more slender upper halves glide under the preorbital. When the head is viewed in front, two short parallel ridges are seen covering the pedicles of the premaxillaries, above which, on the forehead, there is a deep oblong depression bounded by an elevated bony ridge, from which a side ridge formed by the prefrontals proceeds to each orbit. The margins of the orbits themselves are elevated and uneven, and there is a prominent bend upwards on the edge of each postfrontal bone; the rest of the top of the head is occupied by the front rays of the dorsal fin. The preorbital sends one obtuse ridge forwards over the middle of the maxillary, and another and a larger one backwards in the situation of the spine of an *Apistes*; this one is knobbed at the end and curved upwards. The suborbital chain is elevated and very uneven throughout, particularly the ridge which traverses the cheek to the hollow of the preoperculum. There is a blunt process from the angle of the latter bone, representing the spine common in this family, and three smaller knobs below it, the edge of the bone being also raised in a slighter degree. Two slightly diverging ridges, ending bluntly, cross the operculum; there is a small blunt point on the interoperculum, and four obtuse eminences between the eye and shoulder, representing the two ridges shown in that part in the *Scorpaena*. The parts between the bony eminences on the head are covered with small spines like those of the body, and the whole, in the recent state, seems to have

been enveloped in soft skin, which in the dried specimen has left traces of a short skinny fringe on the lower jaw and of filamentous points elsewhere. There are several open pores on the limbs of the mandible. The gill-membrane is smooth and is sustained by five curved rays. The gill-openings are closed above the gill-plate, but extend from the point of the operculum downwards and forwards to opposite the articulation of the mandible, being sufficiently ample.

The whole skin of the body and the lower parts of all the fins are studded with straight acute spines, each enveloped in a skinny sheath. The lateral line is nearly straight, having merely a slight rise over the pectoral. It is marked by a smooth furrow and a series of ten or twelve skinny processes.

The dorsal extends from between the eyes the whole length of the back, but is not actually connected to the caudal fin. It is highest anteriorly, lowest over the pectoral, and of medium height and nearly even posteriorly, its end being rounded off. The second spine, which stands over the middle of the orbit, is the tallest, its height being but a little less than that of the head; the first and third rays are only a little shorter, while the fifth and sixth are much lower, producing a deep notch in the fin. The eighth and following spines are very slightly graduated, and from thence to its rounded extremity the outline of the fin is even. The membrane is notched between the rays, and the tips of the jointed rays curve backwards. The first seven or eight spines are pungent, but the six following ones are less so, and are not easily distinguishable in the dried specimen from articulated rays in which the joints have become obsolete. The fore-part of the dorsal shows some small membranous points on the spines. The anal is similar to the soft dorsal, but terminates further from the caudal, and if it be furnished with a spine it is concealed at the base of the first soft ray, there being no appearance of one externally. The caudal when fully spread is almost circular in outline. Its rays are simple, with the tips projecting beyond the membrane, especially those of the extreme pairs above and below. The pectoral has the oblique semi-oval form of that fin in *Synanceia*, but is less adnate to the side. Its rays are simple, with projecting tips. The ventrals, formed of one spine and two unbranched rays, stand exactly under the base of the lowest pectoral rays, and are small.

The only vestiges of colour remaining in the dried specimen are brown and purple bands and blotches on the dorsal, caudal and pectorals, with one or two rows of white spots on the two latter fins.

CHEILODACTYLUS CARPONEMUS, Cuv. et Val. v. p. 362. pl. 128.

Radius.—Br. 6; D. 17|31; A. 3|19; C. 14 $\frac{5}{6}$; P. 8 et VII.; V. 1|5, spec.

This fish is the "Chettong," No. 39, of Neill's drawings, and the "Jew-fish" of the sealers who frequent King George's Sound. Mr. Neill informs us that it is an inhabitant of rocky shores, and that individuals are often taken which weigh more than 16 lbs. It is readily captured by the hook.

The specimen described and figured in the 'Histoire des Poissons'

was obtained by Messrs. Quoy and Gaimard in the same locality with Mr. Neill's, and the latter accords perfectly with it; but I am persuaded that the references in that work referring to Solander and Forster's accounts of a New Zealand species ought to be struck out. Some notices of the discrepancies between the memoranda of these authors and the history of *Ck. carponemus* in the 'Histoire des Poissons' have been given in the 'Zoological Transactions,' vol. ii. p. 101, and since the date of that publication the examination of various Australian specimens has strengthened the reasons I had for coming to that conclusion.

The *Cheilodactylid* do not accord well with the typical *Sciaenidae*, and the evidences of the ptenoid structure of their scales are often deficient; the teeth on the disks becoming perfectly obsolete, and none existing on the margins of the scales of any species we have examined. In Mr. Neill's specimen the length of the head is contained four and a half times in the total length of the fish, in which the caudal is included. The height of the preorbital equals the diameter of the orbit; and its length is considerably greater, being about equal to one-third of the length of the head. The teeth on the jaws are needle-shaped, small, and arranged in a narrow, not crowded band. The vomer is smooth. The dorsal fin is low, the sixth and tallest spine being only equal to a quarter of the height of the body, and the fifth and seventh spines are scarcely shorter. The spines lower a little towards the soft rays, but there is no decided notch. None of the spines are stout. The second anal spine is as long as the third one and is thicker. The tenth or long pectoral ray reaches beyond the first third of the anal; the caudal is deeply forked. The transverse diameter of the scales generally exceeds the longitudinal one.

Mr. Neill's drawing represents five yellowish lines on each side of the face, reaching backwards to the occiput, the three lower ones crossing the upper part of the preorbital and being interrupted by the eye. The under and fore edge of the preorbital is marked by a blue line, which is prolonged to the temples, and there is also a short blue streak immediately under the orbit, the iris itself being likewise of that colour. Two blue lines traverse the summit of the back close to the dorsal, disappearing under the middle of the soft portion of that fin. The same colour exists on the membrane joining the first three dorsal spines, on the spines of the anal, the ventrals, the long pectoral ray, and the upper and under edges of the caudal, the tint in all these cases being a pure indigo. The rest of the fins are of a paler colour, approaching to mountain-blue.

CHEILODACTYLUS MACROPTERUS, Forster.

Sciaenoides abdominalis, Solander MSS. *Pisces Australiae*, p. 11.

Sciaena abdominalis, *Idem, op. citat.* p. 29; *fig. pict.* *Parkins*. 2-40.

Sciaena macroptera, Forster, *Descrip. Anim.* p. 136. *fig. 206.*
Georgio Forst. picta.

Radius.—Br. 6; D. 17/26; A. 3/4; C. 17; P. 15; V. 15, Soland.
Br. 6; D. 17/26; A. 3/4; C. 30; P. 9 et VI.; V. 15, Forst.

Of this species I have seen no example, and it is known to me only by the descriptions and figures above referred to. It inhabits the bays of the middle island of New Zealand, and was taken on Cook's first and second voyage in Queen Charlotte's Sound and Dusky Bay. At the latter place its native appellation was ascertained to be "Tāraghee," but the seamen called it "Cole-fish." That it is different from the *Ch. carponemus* of the 'Histoire des Poissons' I am inclined to believe, from the dissimilarity of the figure in the latter work with those drawn by Parkinson and George Forster, and from the more notched dorsal and stouter dorsal and anal spines than we find in authentic specimens of *Ch. carponemus* from King George's Sound. These discrepancies, and the smaller number of dorsal and anal rays, authorise us to keep it distinct until an opportunity occurs of examining the New Zealand fish. The broad black band which descends from the shoulder not quite as far as the pectoral is a good distinctive mark. The reader is referred to the 'Zoological Transactions,' vol. iii, p. 101, for extracts from Solander's notes, which may be compared with Forster's description in the 'Historia Animalium,' &c. p. 136.

Some specimens of *Cheilodactyli* from Sydney which I have seen point at a species nearly allied to the two preceding ones as existing in that part of Australia, but the materials I possess are not sufficient for the elaboration of its distinctive characters.

CHEILODACTYLUS NIGRICANS, Richardson.

Radius.—Br. —; D. 15 $\frac{1}{2}$; A. 319; C. 15 $\frac{2}{3}$; P. 9 et V.; V. 15, spec.

Toorjenung, Neill's drawings, No. 42.

This fish is the "Toorjenung" of the natives of King George's Sound, and the "Black Jew-fish" of the sealers. Mr. Neill says that it grows to a large size, feeds grossly, and that its flesh is dry and dark-coloured. It is much prized by the aborigines, and forms a principal article of food among the native families, who are expert in spearing fish. The head of a large fish is said to make good soup. It is an inhabitant of rocky points that project from sandy bays, and moves sluggishly along the bottom, ploughing the sand with its soft fleshy lips; hence it falls a ready sacrifice to the native spear.

In shape this fish approaches to *carponemus*, but is rather more elongated in the body, and has a more arched spinous dorsal. Its eye is more remote from the gill-opening, being nearer to the middle of the head, and the preorbital is shorter, its length not exceeding the diameter of the orbit. The most striking dissimilarity to the preceding species is in the longest pectoral ray, which projects only about one-sixth of its length beyond the membrane. It is the uppermost of the simple rays, and the four others are graduated and also project beyond the membrane as far in proportion. The disk of the preoperculum is broad, that of the interoperculum fully equal to it, and both these bones and the cheek are scaleless in the specimen, which has sustained some damage in the head, but not apparently in these places. *Ch. carponemus* and *aspersus* have interopercular bones rather narrower than the disk of the preorbital, and both these

bones, with the cheek, are covered with small scales which do not extend to the preorbital. In *aspersus* a small part of the cheek next the preorbital is scaleless. In all these species the operculum and suboperculum are densely scaly. The integuments of the cheek of *nigricans* are full of pores, and the lips are large and fleshy. About forty-eight scales occur in a row between the gill-opening and caudal, with three or four rows in addition on the base of that fin. About seventeen compose a vertical row at the shoulder. The scales of the lateral line are, as in the other species, smaller than those above and below, which also overlap them. The exposed disk of a scale is rough, with minute points, but the exterior margin is thin and membranous. The base is faintly marked by a dozen or more slightly divergent furrows, which do not produce marginal crenatures. The sixth and tallest dorsal spine equals one-third of the height of the body and is higher than the soft rays, which rise considerably above the posterior spines. The third anal spine is more slender and considerably longer than the second one. None of them are strong. The caudal is forked to half its depth, and has acute lobes.

In Mr. Neill's drawing this fish is represented as having a dark greyish-black colour on the back, head and fins, and as being pale on the belly. The lips are flesh-coloured. Length of the specimen 21 inches. The drawing is two feet long.

CHEILODACTYLUS ASPERSUS, Richardson.

Cheilodactylus carponemus, Richardson, *Zool. Trans.* vol. iii. p. 99, *exclus. synon.*

Radius.—Br. 6; D. 17|27; A. 3|11; C. 13 $\frac{6}{7}$; P. 8 et VII.; A. 1|5, specimens.

This fish frequents Port Arthur in Van Diemen's Land, and Dr. Lhotzky says that it is never taken at Sydney. In the 'Zoological Transactions' for 1841 (vol. iii. p. 99) there is a notice of it, to which the reader is referred; but it is necessary to state that the number of fin rays there given are those of *Ch. carponemus*, as expressed in the 'Histoire des Poissons.' I there pointed out some of the discrepancies between the examples of this fish I had then before me and the description and figure of *carponemus* in the work just referred to; but being at that time very imperfectly aware of the number and variety of the *Cheilodactyli* existing in the Australian seas, I did not venture to indicate it as a proper species. This I am now enabled to do, after a careful comparison of the specimens then commented upon with Mr. Neill's example of *carponemus* from King George's Sound, the exact locality of the specimen of the latter described by Cuvier and Valenciennes.

Ch. aspersus is a higher fish than *carponemus*, the greatest height of the body being contained only three times and one-third in the total length, caudal included. It is much compressed, with an acute back and a deeply-forked caudal. The more arched form of the spinous part of the dorsal fin, and the much stouter dorsal and anal spines, afford a ready means of distinguishing the dried specimens. The different colours and markings of the recent fish are very appa-